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JAPANESE BRONZES.

By R. I. Geare.*

In early times the bronze used by the Japanese was either of Chinese or Korean origin. Five principal kinds were recognized: Karakane, made of copper and tin; Shakudo, made of copper, silver and gold; Shibuichi, containing 5 to 50 per cent. of silver to copper; Shirichiu (brass), from 25 to 50 per cent. of zinc to copper, and Seido, composed of copper, lead and tin. Although the Japanese doubtless imported bronze mirrors and other objects from China and Korea prior to the Christian era, bronze composed of metal from Japanese ores was probably not made much earlier than the end of the seventh century A. D. The descendants of imported Koreans, mingling with the Japanese, were the first native bronze manufacturers.

SOME EXAMPLES OF JAPANESE BRONZE CASTINGS.

Fig. 1. Bronze figure of a cock, signifying peace.

Fig. 2. "Jiariya," chief of the brigands.

Fig. 3. One of the seven Japanese patrons of husbandry, cast in gold bronze.

Swords and arrowheads were among the first articles made; and later, objects of enormous size were cast, such as the colossal image called Yakushi Niorai in the temple of Yakushi, at Nara, cast about 700 A. D., and believed to have been made by the Korean monk Giogi; the great bell in the grounds of the Todai temple, at Nara, which measured 13 ft. 6 ins. high; the gigantic image of Rochana, in the same temple, measuring 53 ft. in height, and said to contain 500 pounds of gold, 16,827 pounds of tin, 1,954 pounds of mercury, and 986,080 pounds of copper.

Japan was overrun by revolutions from 1200 to about 1600, during which time bronze images and bells still continued to be made, but it was not until the Tokugawa period (1603-1868), during which Japan was ruled in the name of the Emperors by Shoguns of the Tokugawa familty, that bronze-making regained its greatest impetus, and it is to the Shoguns, Saimios and others that credit should be given for the wide spreading of the industry. Then flourished the artistic age of bronze, the decorations varying from simple examples of flowers, etc., to the most intricate designs representing Buddhistic motives. Pure gold was often used, and the era of Japanese art was fairly ushered in. The objects which then began to be manufactured included almost everything relating to personal adornment, figures for temple and house decoration, gigantic figures for the gables of buildings, etc., besides a host of lesser objects, such as mirrors, medicine boxes, tobacco pouches, pipes, cases for writing implements, hairpins and many other things designed for the use of a cultured people.

Representations of the entire human figure were not often made in bronze, and those which were cast were not altogether satisfactory, as the artists were apparently unable to free themselves from the conventional styles of the old Japanese schools. In the early centuries, models made of stone were used for casting weapons in bronze. Later, clay molds were in-

*United States National Museum, Washington, D. C.

troduced. Casting in molds of sand or loam was also practised at an early date, and at the beginning of the eighth century this process was employed in the mint for the production of bronze coins. The method as now employed in Japan is here briefly described and embraces the following operations: (1) Preparation of the mold and core; (2) the furnace appliances; (3) the process of casting.

The materials used in the preparation of the molds are vegetable wax, beeswax, resin, clay (raw and burned), river sand, chopped rice straw, and rice husks. The molds are tempered by long exposure to the weather, which causes them to become very hard. The core, or piece around which the metal is poured, is generally solid when small figures are to be made, but in other cases it is hollow. The hollow core is either open at one or both ends, generally the latter. In this case its thickness is about the same as that of the outer shell of the mold, forming in reality its inner wall; and in employing this kind of core almost all castings, even of vases, braziers, etc., are without a bottom, the bottom of the object being cast separately and afterwards soldered on. After the core has been completed and dried, the object is modeled on it in wax of the proper composition. The wax model is then coated with successive thin layers of fire-clay applied with a brush, until the crust is thick enough to allow coarser clay-layers to be applied, this being necessary in order to give the desired strength to the mold. The mold is then dried very slowly in a warm part of the foundry, and when dry, the core is removed and the wax melted out with a charcoal fire. By this means both the hollow core and the outside of the mold are heated. At the same time any moisture is expelled and the walls of the mold are baked hard. Sometimes the models were prepared in sand or loam, but as this method has not been extensively practised by the Japanese except for casting flat objects, the details will be omitted.

The furnaces and appliances for melting and casting bronze consist of a series of cupola furnaces in segments, several crucible furnaces, and two kinds of blowing machines. When only small castings are to be made, the bronze is generally melted in crucibles, but for larger ones, one or more cupola furnaces are used. The lowest segment consists of a cast iron pan lined with fire-clay and a coating of clay and charcoal. The aperture in front is used for tapping out the metal, with another one at the back for the insertion of the "twyer," through which the blast is introduced. The twyer, or "tuyere," is the pipe or nozzle through which the air is forced into the cupola. The other segments are cylinders of fire bricks or slabs, cemented together with fire-clay and firmly bound with iron bands. Two kinds of blowing machines are in use for producing the blast. One of them, called the "fulgo," is a rectangular wooden box, fitted with a piston which works horizontally, and is provided with four valves which cause a blast to be produced by both the forward and backward motion of the piston. The other one, called "tatara," consists of two air-chambers of wood or clay, the bottoms of which constitute an inclined plane sloping from a central ridge.

When the mold is ready for the operation of casting, the bronze is tapped into four iron ladles, each held by a workman, and a small quantity of wood ashes is thrown on the surface. The men stand opposite the lower ingates, or openings into the mold, and at a signal pour into them the contents of their ladles. This operation is repeated until the mold is filled, and during its continuance finely powdered rice bran is thinly sprinkled on the metal as it flows from the ladles. The mold is then allowed to stand for six hours before breaking it from off the casting. In making large castings ladles are not used, the bronze being allowed to run from the cupola furnaces, first into a receptacle lined with fire-clay, and then from this, through an aperture in its bottom, into the mold.

The art-instinct, which pervades all things Japanese, is well manifested in their bronze work. Japanese history abounds in myths, legends and fanciful conceits, and many of them have been excellently portrayed through their art in bronze. A few carefully selected subjects are here reproduced from original pieces in the National Collections in Washington, several of which belong to the celebrated Capron collection purchased by the United States Government many years

EXAMPLES OF JAPANESE ARTISTIC BRONZE CASTINGS.

Fig. 4. Two Ho Ho birds, heralds of great events.

Fig. 5. "Shoki," foe of sickness and disease.

Fig. 6. Artistic reproduction in bronze of Japanese flowers and birds.

ago. The figure of a cock standing on a drum, Fig. 1, typifies good government and a peaceful state of society. It was an ancient custom in China and Japan to station a drum on a stand in front of the magistrate's office. Anyone who had been maltreated could by beating on the drum secure attention and receive proper redress. A long interval of peace has caused the drum to be neglected, and overgrown with vines. Rust has corroded it, and a large piece has fallen away, affording an entrance to the mother hen, who is seen quietly reposing inside with her little brood. The second illustration, Fig. 2, depicts, in bronze, Jiariya, or "Young Thunder," who in his youth became chief of a band of brigands. They started out one day to rob an old man named Senso Dojin, who had lived in the mountains for many centuries, and whose real body had assumed the form of a frog. When Jiariya met the old man, the latter undertook to teach him the secrets of the spirits of the mountain—how to control the elements, the manner of governing frogs, etc. Jiariya departed with the determination of ceasing to rob the poor, and was afterwards made Daimio of Idzu.

One of the seven Japanese patrons of husbandry is next shown, Fig. 3, mounted on a mythical animal resembling a reindeer, and engaged upon an errand of mercy. This object is cast in gold bronze, and is regarded as a very spirited piece.

The central figure in Fig. 5 is that of Shoki destroying two demons of sickness. He has placed his foot on one of them, while holding the other aloft in his left hand. It is difficult to conceive of any metal work more highly artistic than the objects shown in the two remaining pictures, Figs. 4 and 6. The first consists of two Ho-hos, which are supposed to visit the earth only as forerunners of some great event, or to announce the appearance of a great leader. These birds roost only on the most beautiful trees, eat only the seeds of the bamboo, and quench their thirst from the sweetest springs. The Ho-ho is the Japanese phoenix, and is embroidered on the Mikado's state robes.

The last illustration represents a basket containing plants of different kinds, with foliage and flowers of gilt and silver. From the sides of the basket arise two branches of the Japanese plum-tree, and on them are perched a Japanese nightingale and his mate.

CHEMICAL, COMMERCIAL AND COMMON NAMES OF CHEMICALS USED IN DIPPING, PLATING AND COLORING OF METALS.

SOME ADDITIONAL COMPOUNDS TO BE ADDED TO THE LIST PUBLISHED IN THE METAL INDUSTRY, JANUARY, 1908.

BY CHARLES H. PROCTOR.

ACID COMPOUNDS.

Acid Phosphate—Soluble acid phosphate; super-phosphate of lime.

Carbolic Acid—Phenol; phenyl alcohol; phenic acid; phenylic acid; coal tar creosote; hydrated oxide of phenyle. (Acidum carbolicum. Latin.)

Capric Acid—Rutic acid. (Acidum capricum. Latin.)

Chromic Acid—Anhydrous chromic acid; chromium trioxide. (Acidum chromicum. Latin.)

Formic Acid—Hydrogen formate.

Hydrofluoric Acid—Fluoride of hydrogen; hydric fluoride. (Acid hydrofluoricum. Latin.)

Gallic Acid—Trioxylbenzoic acid. (Acidum gallicum. Latin.)

Lactic Acid—Acid of milk. (Acidum lacticum. Latin.)

Malic Acid—(Acidum malicum. Latin.)

Phosphorus Acid—Tryhydric phosphoric and tribasic phosphoric acid.

Glacial Phosphoric Acid—Monobasic phosphoric acid. (Metaphosphoric acid.)

Plumbic Acid—Binoxide of lead.

Pyrogallic Acid.—Pyrogallol; galline. (Acidum pyrogallicum. Latin.)

Salicylic Acid—Ortho-oxybenzoic acid.

Selenic Acid—(Acidum selenicum. Latin.)

Stearic Acid—Stearin.

Carbonic Acid—Carbon dioxide; carbonic anhydrate; choke damp.

Amyl—(The Radical.)

Amyl Acetate—Banana oil; pear oil.

Amyl Nitrate—(Amyl nitris. Latin.)

Amyl Valerianate—Apple oil.

AMMONIUM COMPOUNDS.

Ammonium Acetate—Spirit of.

Ammonium Arseniate—(Amonii arsenas. Latin.)

Ammonium Benzoate—(Amonii benzoas. Latin.)

Ammonium Bromide—(Amonii bromis. Latin.)

Ammonium Citrate—Citrate of oxide of ammonia.

Di-Ammonium Citrate—(Ammonioe citras. Latin.)

Ammonium Ferrocyanide.

Ammonium Sulphocyanide.

Ammonium Tartrate—(Ammonioe tartras. Latin.)

Ammonium Valerianate—(Ammonioe valerianas. Latin.)

ANTIMONY COMPOUNDS.

Antimony Glass—Vitrified antimony; gray oxide of antimony; vitrified oxide of antimony.

Antimony Pentasulphide—Antimonic sulphide. (Sulphur auratum. Latin.)

Antimony Tartrated—Tartar emetic.

ARSENIC COMPOUND.

Arsenic Trichloride—Chloride of arsenic; arsenious chloride; terchloride of arsenic; fuming liquor of arsenic.

Arsenic Fluoride—Arsenious fluoride; arsenic trifluoride.

Arsenious Oxide—White oxide of arsenic.

Arsenic Pentasulphide—Sulpharsenic acid; persulphuret of arsenic.

COPPER COMPOUNDS.

Cupric Oxide—Protoxide of copper; oxide of copper, black oxide of copper.

IRON COMPOUNDS.

Ferric Ferrocyanide—Prussian blue; ferrocyanuret or iron.

Ferric Hydrate—Hydrated oxide of iron; moist peroxide of iron.

Ferric-Ferric Oxide—Magnetic oxide of iron.

Black Oxide of Iron—Lodestone; triferro-tetroxide. (Ferri oxydum magneticum. Latin.)

A FEW SUGGESTIONS ON TURRET LATHE PRACTICE IN THE MANUFACTURE OF BRASS GOODS

By E. Dietz.

(Continued from May.)

Quite a prominent part in the manufacture of brass specialties on turret machinery is played by forming tools of the various types. They are used to produce pieces, mostly of irregular outline, in one cut. In other words, the outline of the cutting edge of the tool is an exact duplicate of the outline of the piece to be made. They are set, either with the cutting face radial or on a level with the center line, or tangent to the

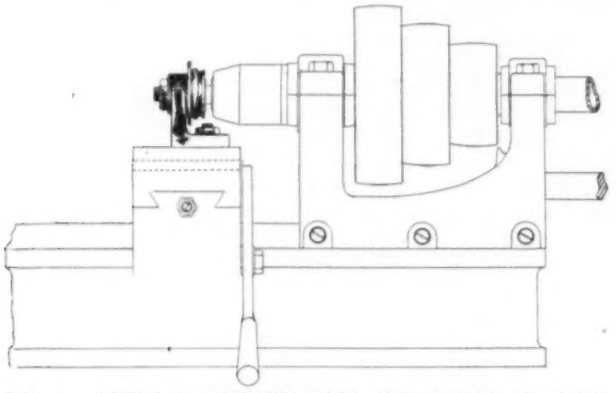


FIG. 1. CIRCULAR FORMING TOOL IN POSITION ON CROSS SLIDE OF MACHINE. FRONT VIEW.

circumference of the stock. In both cases the diameter of the finished product is determined and regulated by the stops in the cross-slide of the machine. The simplest forming tools are made of flat tool steel of a size to fit the tool post of the machine. If the piece to be turned is longer than the width of the steel the tool may be upset and forged out to the necessary width.

In finishing the tool care should be taken to have the cutting face and the base of the tool parallel and to have the sides of the shank square with the base.

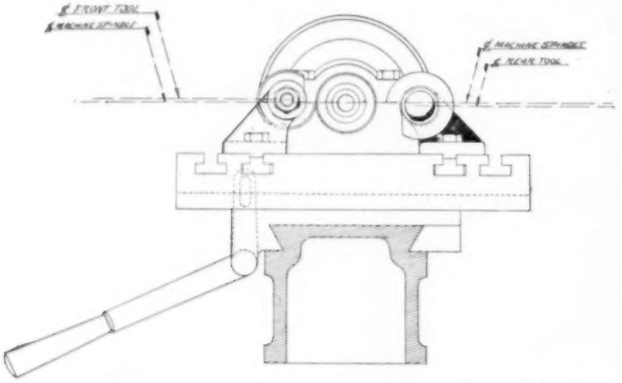


FIG. 2. CIRCULAR FORMING AND CUT-OFF TOOLS IN POSITION ON CROSS SLIDE OF MACHINE. SIDE VIEW.

In grinding the tools after they are in use, this should also be remembered: A little extra care bestowed upon the grinding, if a fixture for that purpose or a tool and cutter grinder is not on hand, will be rewarded by more and better work. While these forged tools are inexpensive and answer their purpose quite well, they are open to the objection that the setting of the machine is practically lost every time the tool has to be removed for grinding, which causes considerable loss of time and material.

If the number of pieces manufactured is large and the design is not subject to frequent changes it will be found profitable to use tools, which, while higher in first cost, eliminate the defects which make the forged forming tools objectionable.

This led to the design of the circular and straight forming tools, requiring a special holder and arranged to be fed into the work, either radially or tangent to the stock.

Fig. 1 shows the front view of a circular forming tool, with holder in place upon the cross-slide.

Fig. 2 shows a side view of the same tool in position on the slide in front, with a cut-off tool in the rear. As will be noted on the sketch, Fig. 2, the center line of the machine and that of the front and back tool do not coincide. The center of the front tool, assuming the machine to run in the usual direction, should be above, and the center of the rear tool should be below the center line of the machine. This offset in the centers produces the proper clearance at the heel of the tool.

The general construction of the tool is shown in Fig. 3, and the details will appear clearly in the sectional view. In the cutter *a* the taper hole and the face bearing against the holder should be ground after hardening, as a perfect fit at these points is essential in order to hold the cutter under the strain of a heavy cut. To make adjustment easy and to prevent the cutter from turning while the nut is being tightened, a key is inserted in the holder *g* and a corresponding keyway milled into the binding-screw *b*. For grinding the nut is taken off, the cutter may then be removed without disturbing the holder or any slide adjustments. Quite a time-saver in resetting the tool after grinding is a gauge of the exact center height of the

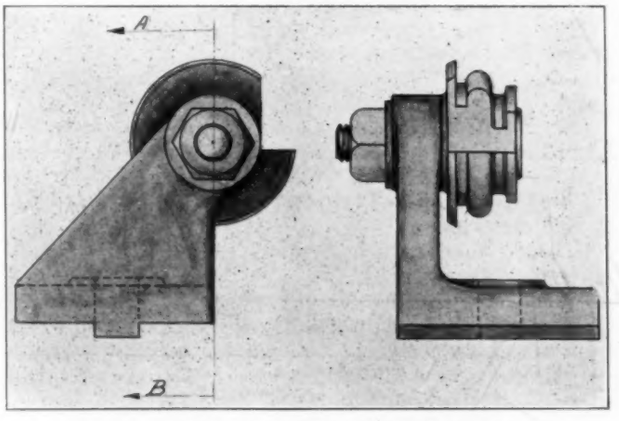


FIG. 3. CIRCULAR FORMING TOOL-HOLDER.

machine from the cross-slide. This gauge is set up in front of the tool, the cutter is turned until the cutting face rests upon the gauge and the nut is tightened.

For grinding the cutters a tool or cutter grinder should be used, or, if such a machine is not on hand, a fixture should be made to be used on the emery grinder, which will assure the cutting edge being square with the face of the cutter. For use on hand-operated screw machines this type of holder will gen-

erally be found to answer all purposes. On automatic machines, on which circular forming tools are used very extensively, it will be found advisable to make provisions for holding the cutter more securely than it is possible with the taper binding screw.

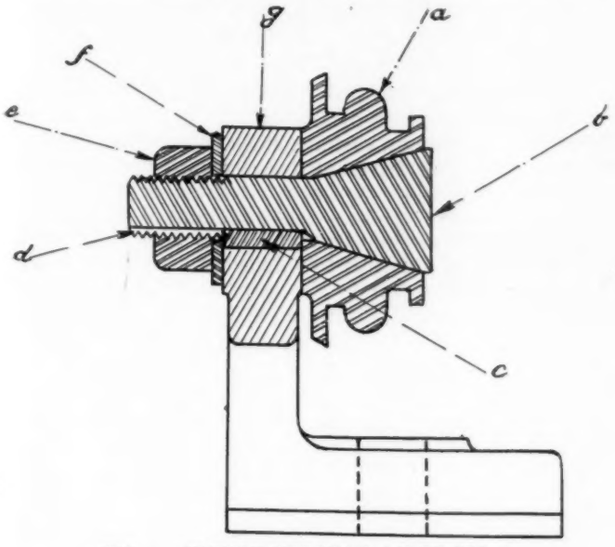


FIG. 4. SECTION THROUGH A-B OF FIG. 3.

The design shown in Fig. 6 possesses the feature of positively locking the cutter in position, in addition to providing a very accurate means of adjusting the height of the cutting edge. It consists principally of a locking arm A, the turned portion of which is accurately fitted to the hole in the tool holder. This locking arm has a series of radial teeth or notches cut into the side facing the cutter. Similar teeth or notches are milled into the cutter so as to interlock with the teeth of the locking arm when placed together. Tightening the binding-screw sufficiently to hold the parts together, but not enough to clamp them against the holder, makes the cutter and the locking-arm

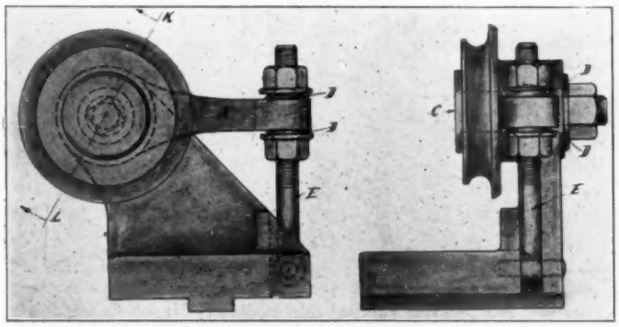


FIG. 5. CIRCULAR FORMING TOOL-HOLDER WITH LOCKING DEVICE FOR CUTTER.

practically a unit. Adjustment for height of the cutting edge is made by raising or lowering the end of the locking-arm by means of the adjusting screw and nuts E, Fig. 5. The general design is shown in Fig. 3, the details appearing in the sectional view, Fig. 6. A shows two views of the locking-arm, B is the cutter, C the clamping screw, E the adjusting screw.

The clamping screw should be provided with means to keep it from turning while the nut is being tightened. The sketch shows a portion of the screw milled square, fitting in a squared hole in the locking lever.

A key and keyway may be found to answer the purpose as well, besides being somewhat less costly to make. The nuts of the adjusting screw E should have a separate recess, fitting so-called ball washers, so as to secure a fair bearing on the locking-arm, irre-

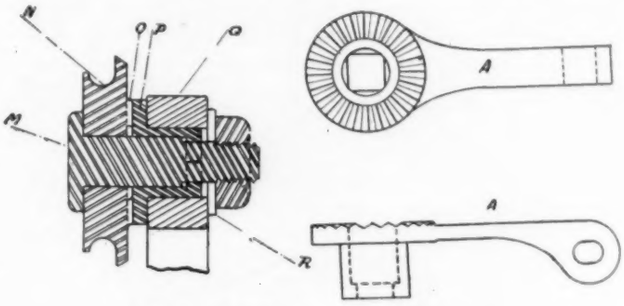


FIG. 6. SECTIONAL VIEWS OF FIG. 5.

spective of the angle of the arm in relation to the screw.

(To be continued.)

ALUMINUM PRODUCTION.

In 1883 the United States produced only 83 pounds of aluminum; in 1893 the production was 350,000 pounds; in 1903 it rose to 7,500,000 pounds; it now exceeds 50,000,000 pounds and commands a market price of about 23 cents.

Bauxite, named after Les Baux, near Arles in France, is the principal class of ore from which aluminum is made, about equal quantities being converted from the bauxites of France and those of Arkansas. This is shown in the following table of the world's production at the date of the latest advices:

WORLD'S PRODUCTION OF BAUXITE—LONG TONS.

Country.	Quantity.	Value.
United States, chiefly Arkansas, 1910...	148,932	$716,258
France, chiefly Les Baux, 1909.....	128,099	251,188
United Kingdom, 1909.....	9,500	11,679
Italy, 1909	3,881	7,610
India, estimated, 1909.....	88	265
Allowance for foreign increase.....	19,500	63,000
Total, 1910, estimated.....	310,000	$1,050,000

Judging from its average yield in the United States, the quantity of aluminum extracted from the world's product of about 310,000 tons of bauxite is roughly about 100,000,000 pounds, worth, say, $20,000,000.

Among the numerous uses of aluminum are household utensils, picture frames, ornamental objects, noncorrosive tubing, such as is employed in the manufacture of paper-pulp, soaps, candles, ammonia, etc., products subjected to sulphuric, stearic or other acids, condenser tube lining, cylinder heads, various alloys, and last, but most important, in the construction of light-weight engines for automobiles, motor boats and flying machines.

We are already beginning to export these objects, following being the figures for the last six years:

EXPORTS OF DOMESTIC ALUMINUM AND ITS MANUFACTURES.

Fiscal year.		Fiscal year.	
1911.....	$1,330,018	1908.....	$290,016
1910.....	666,937	1907.....	442,987
1909.....	341,639	1906.....	318,531

NOTE.—These figures do not quite agree with those published by another department of the Government, but they are from the commerce and navigation reports of the Bureau of Statistics, and are therefore authentic.

FACTORY ORGANIZATION.

By I. M. Wyse.

Success is not attained alone through perseverance and energy in the manufacturing business, experience and competition have taught us that there must enter into the combination that "spells" success, that greatest element known as management, which has lately been boiled down to mean system. Now, system to be productive of much good must be positive in its outline, yet flexible to such an extent as to abridge the ever present shortcomings of its users, which simply proves to us that "mankind is yet human." The well-defined system is symbolical of a great railway, on it we may travel directly to our journey's end, but on our way we find switches and side tracks where we may increase our burden or put on a new head of steam. Thus it is with properly defined system, by its use we increase our activities and are able to do a greater amount of work. This kind of system is not the iron clad soldier form which destroys individuality in heads of departments, but rather increases their efficiency by this added experience. It is rather that kind of system that reduces friction, places responsibility, gives credit for good results, keeps the good will of the heads of departments, reduces costs and finally brings us to our journey's end; success. It is the purpose of this article to deal with the producing end of a manufacturing business employing 300 to 1,000 men. In managing a force of working men it is as necessary to have a good general at the head with competent lieutenants, captains, etc., as it was in the war of the rebellion to have a Lincoln, a Grant or a Sherman. Let us look at the organization Table I:

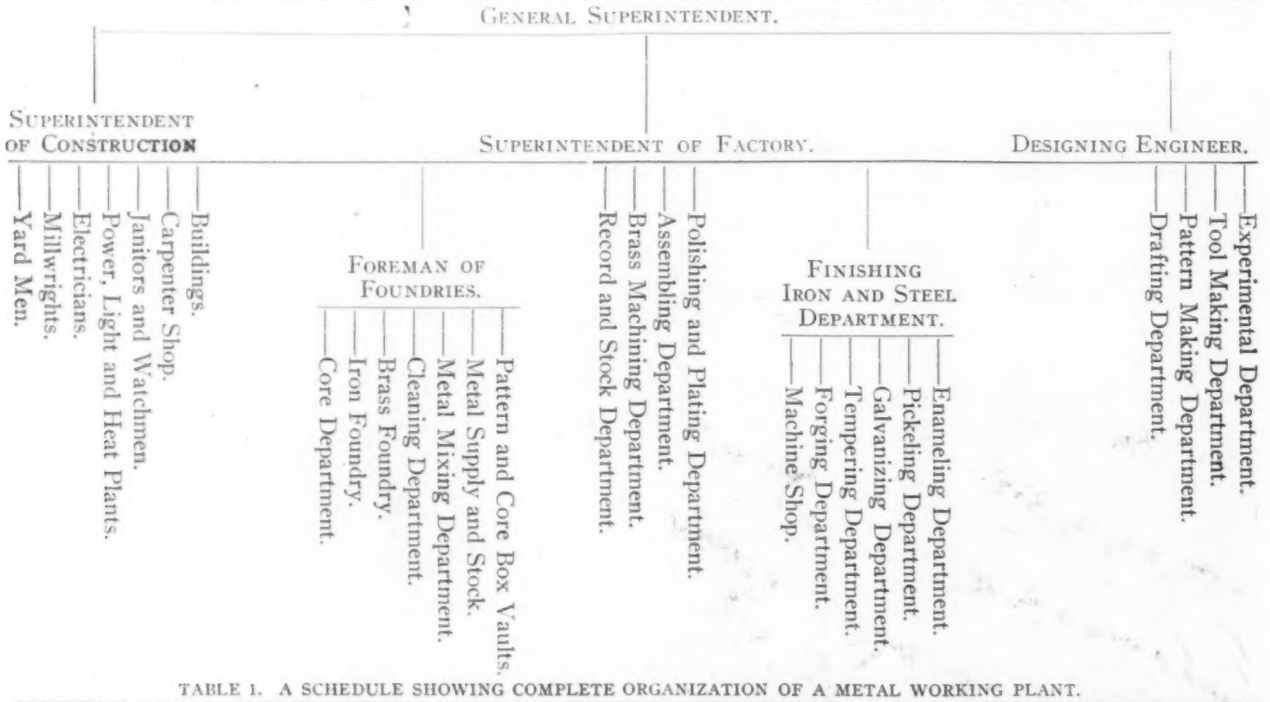


TABLE 1. A SCHEDULE SHOWING COMPLETE ORGANIZATION OF A METAL WORKING PLANT.

By this outline we see at the head the general superintendent, who has, and is, supreme authority, to him are responsible the factory superintendent, the superintendent of construction and the designing engineer, who report the general progress of their work.

DUTIES OF SUPERINTENDENT OF CONSTRUCTION.

The superintendent of construction has charge of the buildings, makes repairs, makes machine transfers, directs the electricians, oversees the power and light and heat plants, carpenter shop and furnishes the shipping department with shipping cases. These departments being put under one head are in no way contingent upon the operations of any other departments.

DUTIES OF SUPERINTENDENT OF FACTORY.

The superintendent of the factory has charge of the foundries, core room, castings stock department, finishing shops, assembling department and record department, to him are responsible the heads of these departments in general and he is under the direction of the general superintendent and is assistant to him with reference to the operation of the other two divisions. He also supplies necessary information to the sales department and the shipping department concerning orders.

THE DESIGNING ENGINEER.

The designing engineer has charge of the experimental, drafting and tool making departments and pattern shop. It is the business of the engineer to make all experiments and tests necessary to assure the correct working of tools, patterns, etc., and then turn over all drawings, tools, patterns, etc., to the record department, which department makes proper records and the distribution of tools, patterns, etc.

Table II.

Uneda Valve Company, Lesswood, Kans.
Order No. 1683. Received 8/3/08. Must ship 8/8/08.

For Consumers Pump Company,
of Kalamack, Mich.

No. for Order.	No. for Stock.	Size.	Cat. No.	Description.
300	1,000	2¾"	H86A	Brass Pump Cylinder.

While in this article we will not go into minute detail as to the many systems operating in conjunction with this general plan, let us look at the plan as sketched above and trace the operation in general of completing an order. See Table I. Since we are dealing with the producing end of a regularly organized manufacturing business (not a jobbing business) we will have to step out of our borders a little and see where and how we receive our order. An order is received by the sales department, passes through the hands of all parties concerned, and is sent to the general stock department, where all goods that can be are placed on the order. Then the stock clerk writes the orders to the factory departments for such goods as are needed to complete the order on an especially prepared order sheet, making necessary carbon copies. See Table II. Let us bear in mind we are considering a manufacturing business having a staple line of goods and that unfinished material that can be applied on this order is found in the different shops and stock room.

The stock clerk understands his order to such extent as to know what departments in the factory will need this order, so a corresponding number of order sheets are sent to the factory. The goods mentioned on this order are made up from brass and iron, so necessarily, copies are given to castings stock department, finishing shop, brass, iron and steel and assembling departments. The foreman of the casting stock department keeps a record system, by which he can tell what castings he has, also what unfinished material is going through the different shops that can be applied on this order, so he checks up his order accordingly and issues a new order to the foundries for what material is needed to complete his order. See Table III below.

FOUNDRY AND CORE ORDER No 318.

Received 8/4/08. Must have 8/6/08.

No. for Order.	No. for Stock.	Size.	Pattern No.	Core Box No.	Molder No.
300	1,000	2½"	1321	686	221

Signed, Johnson, Castings stockkeeper.

By referring to Table III we can readily understand the progress of the order through the foundry departments. First casting stock department issues this filling in number for order, number for stock, size, core box number and pattern number, leaving vacant name or number of molder. This being filled in by the foundry foreman simply for a matter of record for the benefit of himself and the head of cleaning department, who should know just where to look for the castings desired. The above Table III suggests that the castings stock department must have a record supplying the necessary information as to core box number, pattern number, etc.

In an article to follow this one will be shown, and clearly set forth, this system of record-keeping for foundry operation, also a complete and automatic stock record for keeping record of rough and unfinished or partly finished material in progress through shops. Later on another operating system controlled by the same stock department, whereby all work is supplied directly to the men at lathe and bench in the finishing shops will be given. In this system we will see how neither workman nor foreman need concern himself about what he will work on next, as this will be supplied in due time and accompanying such work will be the necessary tools which by the automaticity of the system relieve the workman of all loss of time in looking up tools and gives the full time of the foreman to the instruction of his men.

MEMORIAL TABLET IN MAIDEN LANE.

The above tablet was presented by Edward Holbrook, president of the Gorham Manufacturing Company of Providence, R. I., to the Maiden Lane Historical Society of New York. The unveiling of the tablet took place on November 25 in the Silversmiths' building in New York. H. K. Sloan, president of the society, received the tablet. The tablet is composed of bronze tempered with an aluminum alloy to render it impervious to the attacks of the atmosphere. As will be seen, the tablet is divided into three parts, the upper showing a pair of lovers strolling beside a stream, by which the curved line of the present street is still marked. In the central section is shown the present seal of the City of New York. The lower part contains the inscription, which can be read in our illustration.

THE GALVANIC ETCHING OF METALS.

By Max Schweizer.*

MAX SCHWEIZER.

The galvanic etching of metals is based upon the experience first, that the galvanic current is dividing many chemical combinations into their constituents, and second, as a consequence thereof, that by the co-operation of the galvanic current, metals may be dissolved in such acids as under ordinary circumstances would act indifferently on the metals concerned. The preparation of a plate or other ready-made article differs from the preparation of an etching with acids only in that, on a part which is not going to be covered by the designs, a conducting wire is soldered, which is covered with an acid resist lacquer. The article is used as an anode and a similar shaped plate is used as a cathode and placed in a suitable bath, which is either composed of a diluted solution of acid or metallic salt. The article is left in this bath until the etching is sufficiently deep.

As a current generator a gravity battery or Lalaude or Grenett battery can be used, or a small dynamo may be used. Solutions of the following salts may be used as electric baths:

For zinc.....Sulphate of zinc or chloride of zinc.
For copper and brass.....Sulphate of copper
For steel and iron.....Sulphate of iron or chloride of Ammonium
For tin .....Chloride of tin.
For silver .....Chloride of silver.
For gold and platinum...Gold and platinum chloride.

*Practical Etcher, Bridgeport, Conn.

With diluted solutions of muriatic, sulphuric and nitric acids, baths can also be used on such metals which by themselves are not soluble in diluted acids, for instance, copper is not soluble in diluted sulphuric acid, but it dissolves copper readily with the aid of an electric current. It is best to use the more neutral salts and such as will not act too powerfully, so that the etching will proceed quietly under the influence of the galvanic current. In order that the etching will proceed alike from all sides the anode and cathode must be placed exactly parallel. If round articles are to be etched, such as cups, pitchers, etc., it is necessary to have the cathode of the same form.

The difference between galvanic etching and the usual etching is that the etched lines exhibit when acids are used only and when examined under a microscope, a peculiar, continuous, irregular ridge of recesses and cavities, and that when depth is required the lines increase too much in breadth and often spoil the work. None of these objections touch the galvanic method. The lines, when examined under a microscope represent a perfect groove. If graduations are to appear in the etched work, for instance, some parts are to be etched matt only, then the article is taken out of the bath as soon as the shallow places are sufficiently etched, rinsed off in water, dried and then the parts are covered with liquid etching ground. When this is dry the etching can again be proceeded with until the required depth has resulted.

EXAMPLE OF GALVANIC ETCHING ON A ZINC PLATE.

ELECTROCHROMA.

SOME MORE ABOUT THE NEW METHOD OF METAL COLORING BY ELECTRODEPOSITION.

The article by Charles H. Proctor in the November issue of THE METAL INDUSTRY, describing the new metal coloring process, to which the name "Electrochroma" has been given, was not quite complete, due to our not receiving the photographs at the time of going to press. While the possibilities of the process were given due prominence by Mr. Proctor, the reader was left somewhat in the dark as to the actual carrying out of the method. We have here endeavored to supplement the previous article and tell briefly just how the wonderful results are obtained.

F. A. ROJAS.
President of the Rojas Electro-Chemical Company. Inventor of the Electrochroma Process.

We are able to present two views of the laboratory of the Rojas Electro-Chemical Company. In Fig. 1 is shown a general view of the plant and the tanks in which the work is plated are seen ranged along the wall. These tanks are of wood and contain the plating solutions. The tubs, also seen in the picture, contain the dip solutions, which are used to complete the coloring process. All of the solutions in the tanks and tubs are fully protected by patents and are said by the inventor to be made up of more than a half a dozen elements; the proportions of which are so evenly balanced that a slight variation in the amounts used of each ingredient will throw the entire solution out of gear.

The anodes used in the "Electrochroma" process are of pure carbon, no metal of any sort being put into the tank except the work itself. In starting to color a piece of metal, be it brass, copper, tin, lead or iron, etc., the metal is first dipped into a cleaning solution, then into a hot water bath, then into the tank containing the solution for whatever background color is desired. A current of from eight to twelve volts pressure, with a strength of one ampere per square inch of surface, is used. After an immersion in the tank for from two to three minutes the work is then dipped into hot water, and from there into one of the tubs shown in the picture. Here the finish of the process takes place, and the beautiful shades of color are produced. A piece of work, such as a lock plate for a store door, may be given a green verde smut in the plating tank and then be changed to a light blue background in the dip tub. Gold finishes, rose, antique and green, may be produced at will in a few seconds of time, and, more wonderful still, without any gold in the solution!

Our second illustration shows the method of wiring and coloring a leaded glass lamp shade. No preliminary operation is necessary if it is desired to give a green verde antique finish to the lead, strips dividing and holding the glass sections together. The shade, as shown in the picture, is strung on two wires. One of these wires is a positive and ends in a round block of carbon, which serves for the anode to plate the inside of the shade. The prongs to be seen just above the anode are connected to the cathode wire and hold the shade from slipping all the way down to the anode. These prongs are in contact with the under side of the lead strips of the shade. The cathode or negative wire ending in the prongs is, of course, insulated from the anode or positive wire ending in the anode block. It will be seen, then, that as soon as the shade is immersed bodily in the solution, which, it will be noted, is supplied with carbon anodes around the edge, there will be established complete electrical connection betwen the shade and its two sets of anodes, and it becomes plated both inside and out! At the present time there are four plating solutions in use. No. 1, that gives a hard green deposit capable of buffing. No. 2, a deposit of a black under-body and a soft green smut that is easily removed for relieving purposes, leaving a black high-light. No. 3, a deposit of a bronze under-body with a soft green smut. From No. 4 we obtain the different shades of color to imitate gold from 24 karat down. Visitors are always welcome at the laboratory, 516 West Twenty-fifth street, New York City.

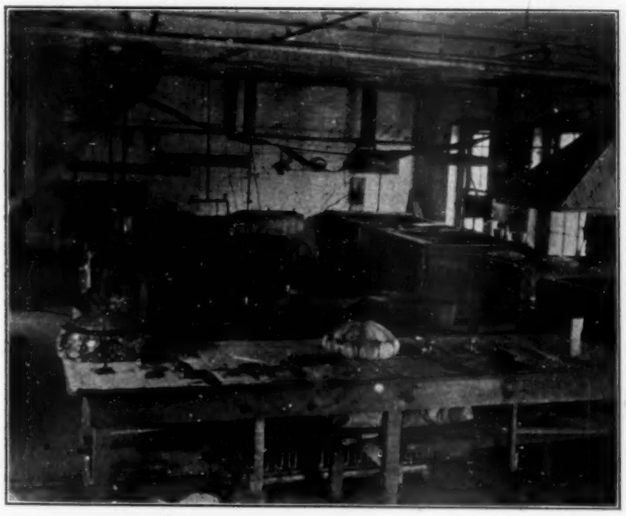


FIG. 1. VIEW IN LABORATORY OF ROJAS ELECTRO-CHEMICAL COMPANY.

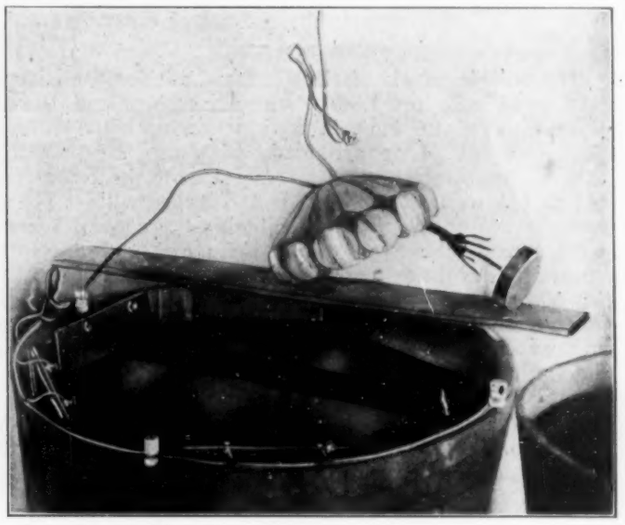


FIG. 2. SHOWING HOW A LEADED GLASS SHADE IS HANDLED.

NON-FERROUS METALS IN RAILWAY WORK.*

A Classic Article Giving a Description of the Application of the Metals in Railroad Equipment.

By George Hughes, Inst. C. E. M. I. Mech. E.†

(Concluded from November.)

WHITE-METALLING AXLE-BOXES.

As an example of this process, a radial axle-box brass will be dealt with. This consists of a cast iron box, *a*, having three sides, and a heavy base; and a plate, *b*, resting on the base of, and secured to, the box, by four links and cotters, *d* and *e*, to which is attached the cast iron chill *c*. The combined plate and chill, *b* and *c*, having been removed, the brass *f* is placed in the space formed by the three sides of the box; the plate and chill is secured in position as aforementioned, and the white metal poured in from the top, filling the space *g*. The same procedure is adopted when the brasses are metalled in the first instance. The old metal having been melted out of the box, the recesses are well cleaned and rasped with a coarse file. All dirt having been thoroughly removed, the box is placed on a coke fire and slowly heated. By the use of sal ammoniac and tin, a very thin coating is produced for uniting with the white metal, which is then cast into the bearing. The metal (type "B") is cast at a temperature of 450 degs. C. from the open pan fire.

Other white metal mixtures are:

Lead.	Tin.	Antimony.	
92	..	8	For packing ball-joint water pipes.
70	17	13	Metallic packings.

ALUMINIUM.

It is only in quite recent years, after a considerable reduction in price has been made, that the use of aluminium can be shown to be a commercial advantage in many branches of railway engineering and rolling stock, where it is slowly supplanting the use of other metals.

CAR PANELS.

The outside panels of electric cars built for the Liverpool and Southport Line of the Lancashire and Yorkshire Railway to work in conjunction with the Liverpool Overhead Line are made of aluminium No. 16 S.W.G., the largest panel on the side of the car being 6 feet 7½ inches long by 2 feet 8 inches wide. These cars have a turn-under which, taking a convex shape, adds considerable strength to the panel and prevents buckling, this being more apparent when the panel is placed vertically flat on the side of the vehicle. Another feature is, that if the latter panels assume too large an area, especially if of thin gauge, *i.e.* 18 or 20 S.W.G., the varying temperatures will cause the panels to become wavy.

The following comparison between aluminium, baywood mahogany, and steel sheets, used for the outside panelling of a 60 foot electric car will be of interest:

	Weight per Car. lbs.	Cost per Car. £
Baywood mahogany	340—⅜-inch thick	9.3
Steel	525—20 S.W.G.	3.4
Aluminium	225—18 S.W.G.	13.9

The cost given for baywood mahogany allows for interest on the storage of timber for seasoning, repairs, depreciation, and insurance of seasoning sheds.

Although the initial cost of the aluminium panels is much greater than for mahogany or steel, a reduction in the cost of haulage of nearly 33 per cent. in favor of aluminium as compared with baywood, and nearly 60 per cent. as compared with steel, is obtained.

The special feature for which aluminium commends itself for use in car construction, is the lessening of the dead-weight, which, especially in the case of electric trains subject to frequent stops where rapid acceleration and retardation are essential to gain the desired advantages, is of great commercial importance.

The soldering of aluminium is undoubtedly a difficult problem to be satisfactorily solved. This is not only a question of the composition of the solder, but the fact that the surface of aluminium is always covered with an oxide, and although the surface may be freshly cleaned the oxide immediately forms. Another point is the conductivity of the metal which removes the heat from the soldering point. Of various compositions of aluminium solders experimented with, zinc appears to alloy with aluminium more readily than any other metal, as the constituent part of the solder.

Mouldings and Facias and inside Furniture fittings for Steel Cars used on the Tube Railways.—The extended use of steel cars for tube and surface railways and the consequent increase in dead-weight as compared with the older form of timber construction, has led to the adoption of various forms of aluminium mouldings, facias, etc., to compensate to some extent for the additional weight of the steel girders, angles, channels, etc., used in the designs.

Bearings for Carriage and Wagon Axle-boxes.—It is reported that the Northern Railway of France is substituting for the bronze bearings hitherto in use on rolling stock, bearings made of an alloy of 92 per cent. aluminium with 8 per cent. copper, and that certain bearings of this alloy have run 50,000 miles without showing any trace of wear, and owing to its relative lightness the cost has been considerably reduced. Experiments on the Lancashire and Yorkshire Railway do not yet confirm this satisfactory result, it being found that the material is hard and brittle, and considerable labor is involved in properly bedding the bearings to the journals, and preventing heating under normal running conditions.

ANTI-FRICTION ALLOYS.

White metals, for the lining of rolling stock bearings are largely used, although the lining for a pulley-shaft bearing and that used for a railway vehicle will differ, owing to the variation in the load, method of lubrication, and conditions under which they are working.

Of the metals forming anti-friction alloys, it is unusual to find more than three in any particular mixture; a very common alloy used is that for the lining of carriage and wagon bearings, which consists of antimony 15 per cent., lead 70 per cent., and tin 15 per cent. It is common practice for the bearings, after being lined with about 3/16 inch thickness of alloy, to be bored out in a machine and finished off by hand, but successful results have been made by casting a better finished surface from the mould, and bedding it direct on to the journal.

The following types of brass bearings are lined with 3/16 inch white-metal alloy for railway bearings: 10, 12, 15, 20, and 30 ton wagons, and all bearings for carriage stock, and the same applies to private owners' wagons with the exception of wagons of 8 and 10 tons capacity, which are specified in brass; the thickness of the white-metal lining in these vehicles varies from 3/16 inch to 5/16 inch.

*From a paper read at Autumn Meeting, Institute of Metals, New Castle-on-Tyne, England, September 20-22, 1911.

†Chief Mechanical Engineer, Lancashire and Yorkshire Railway.

Sheet Tin.—Sheet tin is used in kitchens and pantries of dining cars, for draining boards, sinks, etc., and also for various other sundry purposes, such as filter linings, etc.

Copper.—Copper is used in the construction of the various types of brine pipes for fish vans, gas lamps, water lavatory tanks and heaters, kitchen and pantry sinks and utensils on dining cars, the latter of which are tinned to prevent any chemical action taking place on the copper.

Lead.—Lead, in its rolled sheet form, is used for the linings of acid tanks, electric-lighting cells and plates, roof coverings, floors of dining-car kitchens, etc.

Brass.—Brass is used in car construction for such purposes as gas and electric fittings, parcel racks, hat and coat hooks, ash trays, hinges, outside door handles and commodes, and various other details for which it is particularly suitable.

Zinc.—Zinc is usefully employed in its sheet form for ventilators, roof coverings, and mouldings.

As a matter of convenience the following table gives in a concise form the composition of these alloys:

TABLE OF ALLOYS MENTIONED IN THE PAPER.

Used for	Cu.	Sn.	Sb.	Zn.	Pb.	Fe.	P.	15 per Cent. Ph. Cu.	Al.	Ni.
Scrap ingot metal.	86.5	7.5	0.08	2.3	3.2	0.2	..	..	..	..
Slide valves	84.5	10	..	..	5	..	0.5	..	..	..
Gun-metal	88	10	..	2	..	..	..	..	..	..
Injector metal	84	8.5	..	5	2.5	..	..	..	..	..
Phosphor bronze..	86	10	..	..	..	..	..	4	..	..
To give	89.5	10	..	..	..	..	0.5	..	..	..
Yellow brass for cab rings, name-plates, etc.	67	..	..	30	3	..	..	..	..	..
Aluminum alloys for motor dust caps	5	..	..	..	..	..	..	..	95	..
Brazing metal	84	..	..	16	..	..	..	..	..	..
Telegraph metal ..	80	5	..	7.5	7.5	..	..	..	..	..
Aluminum alloys for some carriage fittings	15	..	..	..	..	..	..	..	85	..
White metal, "A".	4	82	14	..	..	..	..	..	..	..
White metal, "B".	3	11.5	13.5	..	72	..	..	..	..	..
White metal, "C".	10	80	10	..	..	..	..	..	..	..
White metal for pack. ball joints.	..	..	8	..	92	..	..	..	..	..
White metal for metallic packings	..	17	13	..	70	..	..	..	..	..
White metal for carriage and wagon bearings..	..	15	15	..	70	..	..	..	..	..
Ordinary axle-box bearings	80	5	..	..	15	..	..	..	..	..
20-ton wagon bearings	64	5	..	..	30	..	..	..	..	1
Argozoil (ornamental fittings)..	54	2	..	28	2	..	..	..	..	14
Solder (electric fittings)	..	94.5	..	..	5.5	..	..	..	..	..
Solder (plumbers')	..	50	..	..	50	..	..	..	..	..
Solder (tinsmiths')	..	60	..	..	40	..	..	..	..	..

THE DISCUSSION.

Sir William White, who was called upon to open the discussion, said that though he could not say much about the subject of the paper, he did know something of the work done at Horwich, and had gained great advantage by a visit he paid to Mr. Hughes. One of the main objects of the institute was to place on record the experience gained in the use of the non-ferrous metals and alloys, and papers of this character were of the greatest value, because it was only by means of information such as Mr. Hughes had given them that improvements in manufacture could be brought about and difficulties minimized. In this paper there was a vast mass of experience, put into a concrete form, which represented many years of work on the Lancashire and Yorkshire Railway. Mr. Hughes had continued worthily the work of his predecessor, and the paper was in many respects a model one. Mr. Hughes did not profess to have covered all the ground, and he always associated with his statement of experience the correct expression that other experiences might differ, because the conditions of service might differ. (Hear, hear.)

Mr. A. V. Hussey said that they would remember that two years ago reference was made to a process of welding aluminum. No process of that kind had been worked in this country, but since that meeting another process had been worked on quite a large scale, and had proved most satisfactory. He was surprised that reference had not been made to it, because this system of jointing was applicable to all classes of aluminum, especially aluminum sheets. It seemed possible that the size of the sheets that could be made by this process was practically unlimited. At the same time, he thought that a satisfactory solution of the problem of welding aluminum was far from having been realized.

Mr. J. Hallett, commenting upon Mr. Hughes's statement that bronze slide-valves had not worked very satisfactorily, said that it was in 1893 his firm first fitted bronze slide valves to a destroyer. They continued that practice in every destroyer they built which had reciprocating engines, and found the valves to give the utmost satisfaction, both to the makers and to the users.

Dr. Desch said that the paper was the most valuable paper yet brought before the institute, on account of the great quantity of information, entirely authoritative information, which it gave, and the exceedingly clear manner in which the information was put. Mr. Hughes told them that for fireboxes, copper containing a little more than 3 per cent. of arsenic had proved much more durable than any alloy. That statement was very interesting, as coming from one who had had so much experience in fireboxes, since it was held by many persons that the alloying of copper with other metals had distinct advantages for this particular purpose. The composition given by the author for the white metal "C," viz., tin 80, antimony 10, copper 10, was rather unusual. Such a mixture would be unusually hard, and would tend to develop extreme brittleness. No tables were given for the comparative wear of this alloy, and it would be interesting to have the results of systematic tests carried out with it.

Mr. W. G. Hanna (Manchester) spoke of a process for making bearings from alloys of various kinds, absolutely without tooling. These, he said, had been found of use both on railways and for machinery generally, especially for motors. Bearings made from his alloy by this process would last three or four times as long as those made in the ordinary way, and could be made to a specification limit of a half-thousandth of an inch. In dealing with these metals in the ordinary way they found many draws and imperfections of various kinds that were most puzzling to account for.

Mr. H. L. Woore (Epping) said that the author had not touched upon the reasons why some slide valves wore down in a fortnight, while others of the same material would last several months. It was a question whether or not there was something in the cast-iron of the cylinder which had some effect upon these metals.

Professor Huntington said that perhaps a new point to many of them in the paper was the use of aluminum for railway carriage panels. He thought that during the next few years a great deal would be done in that direction. With regard to the use of the ordinary slide valve under superheat the author seemed to have been very fortunate in the use of ordinary slide valve mixtures, but everybody had not been equally fortunate. Probably this subject would come before the institute in the course of next year, as it was a point of distinct interest whether the ordinary slide valve mixture worked satisfactorily as now used.

Mr. B. H. Boeddicker thought that Mr. Hughes could have entitled his paper more correctly "Non-Ferrous Metals in the Railway Work of the Lancashire and Yorkshire Railway" He (Mr. Boeddicker) was specially interested in the use of nickel and nickel alloys, and he saw with deep regret that Mr. Hughes had only referred to them in two places, and that quite cursorily.

The copper certainly had been very much improved by the addition of nickel. The tensile strength of copper-nickel was given by Mr. Hughes as 15.2 tons after annealing, and 16.2 after being heated for ten hours at 750 degrees C., whilst starting at 16.1 tons, after 10 hours in the locomotive firebox it went up to 17.1 tons. All the other copper alloys had practically decreased in tensile strength under those conditions. He was very much surprised that Mr. Hughes had not much more to say of what could be done with German silver on railways.

Professor Louis remarked that in comparing copper fireboxes with steel, Mr. Hughes did not say anything about the use of Yorkshire best iron in fireboxes. This in a paper coming from Yorkshire was rather curious. He would like to know whether Mr. Hughes had made any comparisons between copper and wrought iron in this connection.

Dr. Carpenter pointed out that Mr. Hughes in his specification on page 41 for copper boiler tubes stated that the tubes for solid drawn were not to be annealed at the ends, but made "half hard" throughout. Mr. Fielding, in his May lecture with regard to the chemical instability of hard-drawn copper, said it would appear that all copper materials used for such purposes ought to be brought into uniform crystallization by annealing at least 300 degrees. This was necessary in order to destroy the enormously hard fibrous film. In view of this specification, this recommendation perhaps might be reconsidered.

The president said that the paper had been a most instructive one. The points referred to by Dr. Desch and Mr. Boeddicker greatly interested him. With regard to fire box stays, Mr. Hughes went for copper as against bronzes, and as far as his experience went that was the present tendency of most locomotive engineers. He had found that, taken as a general rule, they preferred copper or something very near copper as compared with bronzes having a heavy admixture of alloy. The point raised by Mr. Boeddicker with regard to nickel alloys was having attention in the locomotive shops on various railways. Whether the best results were obtainable from copper-nickel or from copper with a slight percentage of arsenic was a very open question. As a manufacturer, it made no difference to him, as they manufactured both at their works, but in almost every case in which engineers had taken to copper-nickel, there was no question of their going back to copper-arsenic. Taking copper with a 2 per cent. admixture of nickel, the result was quite phenomenal. At high temperatures, say at 700 degrees, they would find that this copper-nickel would get a tensile strength of sometimes 12, 13 or 14 tons; while under the same conditions pure copper would go down to 6 tons. Copper arsenic gave a tensile strength of something between the two, but nothing like so high as that of copper nickel. This was a very important matter, as the heat in a locomotive firebox was very intense. Mr. Webb, late of the London and North Western Railway, had given some very startling figures on this point. Another point requiring very careful consideration was that of oxidization. It occurred in both mixtures, but was very much more severe with copper arsenic in any percentage down to .3 or .5 than with pure copper or copper-nickel. Another point that was too often lost sight of nowadays was the question of oxygen. He was not referring to scientific papers, but with the practical maker and the practical user of metals the value of a comparison of the proportion of arsenic with those of other ingredients had not received half enough consideration. Taking an alloy of copper with ½ per cent. of arsenic, and getting, as nearly as could be got from the laboratory, two identical pieces as far as the arsenic and copper were concerned, they would find that if they had a variation—say, for the sake of argument, .02 in the one case and .002 in the other—in the oxygen percentage they would find something startling with regard to the effort of oxidization in metal upon the tensile strength and elongation, and also with regard to the general properties. That was a point well worthy of research by their scientific brethren, and of practical investigation by those interested. Such an investigation would be of great practical use to manufacturers of metal. Mr. Hughes's paper was one of the clearest he had read for some time, and he would ask them to pass a hearty vote of thanks to the author. (Applause.)

EFFECT OF ANNEALING ON BRASS.

It has been shown that the atmosphere of an annealing furnace does not materially affect the properties of brass.

CANADIUM.

The new metal recently reported in the daily papers to have been discovered by A. G. French, metallurgical chemist of Nelson, British Columbia, under the name of Canadism was named Canadium originally by metallurgist French. The change in the name was due to error in telegraphic transmission from one part of the country to the other. Canadium, Mr. French reports, was the result of a discovery of the existence of the platinum group of metals in the early part of the year while investigating troubles at one of the large gold mines in British Columbia. While examining this deposit of platinum metals he found, sometimes isolated and sometimes in combination, another metal which was quite different from all the other members of the group.

The new metal, which has been quite properly named Canadium, was first found in an igneous dike occuring in the Granite Poorman gold mine near Nelson, B. C., and has since been found in many other dikes of the same character throughout a zone of some fifteen miles wide. These dikes extend several miles without a break and in many cases show very fair assays, running from a few pennyweights to three or four ounces of platinum metals per ton. In some of the dikes Canadium is in the greatest proportion, but not always, although it is generally present with the platinum.

Canadium is a beautiful white metal, little softer than gold or silver and melts at a somewhat lower temperature. It is not tarnished by damp atmosphere nor blackened or affected by sulphuretted hydrogen, alkaline sulphides or tincture of iodine, which, as is well known, blackens both silver and palladium. Canadium melts far below the fusing point of palladium and is, when burnished, much more brilliant than either silver or palladium. It is electro-negative to both of these metals and also to gold. It is not oxidized by long exposure to the blowpipe oxidizing flame.

The new metal occurs in the matrix rock in the form of metallic semi-crystalline grains, small rods and scales, and is easily made visible by crushing the matrix to a powder and panning as for gold using, of course, the magnet to separate magnetite and any possible particles of iron which may have gotten into the sample when rubbing down. The beauty of the metal and its permanency will make it useful for many purposes, such as gem setting, search light reflecting surfaces, for which it is better adapted than palladium as it is brighter when burnished, whiter and equally, if not more, permanent in its polish.

LUSTROUS BLACK ON BRASS.

Dissolve freshly precipitated carbonate of copper, when moist, in strong liquid ammonia, using sufficient of the copper salts so that a small excess remains undissolved or in other words that the ammonia is saturated with copper. The method recommended for preparing the carbonate of copper is by mixing hot solutions of equal parts of blue vitriol (sulphate of copper) and sal soda (sodium carbonate), filtering off and washing the precipitate. Dilute the solution of copper salts in ammonia with one-fourth its volume of water, and add one ounce of black lead, and heat to about 100 degs. Fahr. To prepare the work, cut down on a hard wheel, wash out in a potash solution and run through the solution until the article becomes black.

THE ELECTRO-DEPOSITION OF CADMIUM.

By Emmanuel Blassett, Jr.

The discovery of chemical electricity by Volta, in the year 1799, was soon followed by experiments in electrolysis. What appear to be the earliest known facts in regard to electro-deposition are the experiments of Cruickshanks, the inventor of the first electric battery on the lines of today. Cruickshanks attached a silver wire to each terminal of his battery and the other ends of the wires were placed in glass tubes containing solutions of lead acetate, copper sulphate, silver nitrate and other salts. He found that the metals attached themselves to the wire connected with the zinc end of the battery. Cruickshanks' experiments were made in 1803, and seem to be the first instance of the deposition of one metal upon another by the use of the electric current. Results of a more practical nature were accomplished by Brugnatelle in 1805, who succeeded in gilding two silver medals in a solution of "ammonuret of gold." Brugnatelle was a distinguished chemist, and, like Volta, was a professor at the celebrated University of Pavia.

It is a little more than a century since the electro-deposition of one metal upon another was first accomplished, and although at the present time practically all the metals may be produced by electrolysis, only a very few are employed as an ornamental and protective coating for the more common metals. The text books on electro-deposition treat adequately of the deposition of only a few of the metals, and much investigation is yet to be carried on. The deposition of cadmium, chromium, bismuth and others of the semi-rare metal is

BRASS ORNAMENT PLATED WITH CADMIUM.

certainly a subject for investigation by the plater, for they may possess special properties that would adapt them to certain lines of work.

Cadmium, of which this article treats, was discovered by Herman, and also independently, but in the same manner, by Strohmeyer, the latter giving it the name of cadmium, from cadmia, the ancient name of zinc ore. The word is said to be derived from Cadmus, a personage of classical mythology, who, according to Greek tradition, founded the city of Thebes, and among other legendary exploits, was the first to work the mines of Mt. Pangaeon. Cadmium is never found in the free state in nature, but is generally associated with zinc. It is also found as cadmium sulphide in the mineral greenockite. The chief source of cadmium is zinc ore, and it is obtained as a by-product in zinc smelting. Cadmium is more volatile than zinc, and when the zinc is distilled from the retort in which the ore is reduced, the cadmium comes over first. Possibly all the cadmium used in America is imported from Silesia, Germany, which furnishes nearly all the cadmium of the world. So limited is the demand for cadmium in America, that few if any of the zinc works in this country remove the cadmium from their flue dust. They do not consider it a profitable operation, and for that reason cadmium is frequently found in commercial spelter. The present price of cadmium is about $1 per pound, but it should be had considerably cheaper if a steady demand for it is created.

PROPERTIES AND USES.

Probably the largest consumption of cadmium is in the manufacture of sterling silver, in which about 0.50 per cent. is introduced to impart malleability. It is also used with good results in silver solder. Many alloys for bearings containing cadmium have been patented, in which is claimed a very low coefficient of friction. Formerly it was largely used, and is to some extent at the present day being used, in dentists' alloys for filling teeth. The sulphide of cadmium, a yellow compound, is used in the manufacture of paint. Cadmium iodide as well as cadmium bromide are used in photography and the sulphate and iodide in medicine.

Cadmium is generally found in commerce in the form of small round sticks about six inches in length. It may be rolled very thin, some being procured 0.0005 of an inch in thickness. It is a white metal having a slight bluish cast and resembles tin in its physical properties. It is ductile and malleable at ordinary temperature, but becomes brittle at about 82 degs. C., and when bent in this condition gives a "cry" like tin. In its color it resembles tin more than any other metal. It is, however, somewhat more denser and tenacious than tin, and takes a higher polish. It is not attacked by the air, but all strong acids act on it slowly. At a red heat it burns, forming an orange-colored oxide. Cadmium has a specific gravity of 8.7, and melts at 315 degs. C. In its chemical behavior it resembles zinc, forming analogous compounds. Its principal salts are the sulphate, chloride and iodide. Cadmium differs from all other metals in forming a yellow sulphide insoluble in alkalies, and its salts mixed with an excess of ammonia and treated with hydrogen sulphide gas yield a yellow precipitate.

ELECTRO-DEPOSITION.

The writer does not claim originality for the solution for cadmium deposition subsequently given; but he has endeavored to bring out certain points in regard to cadmium deposition that may have been overlooked by the early investigators. Cadmium plating is very old, and no doubt many have tried to make it a commercial success. The first patent for cadmium plating was granted to Russell and Woolrich in England in the year 1849—nine years after the discovery of silver plating—and at the present time there is little if any cadmium plating carried on. The statement made by an early investigator "that we have deposited cadmium but for no useful purpose" does not apply today. Great advances have been made in the arts and industries, and a use will certainly be found for cadmium plating when the process is better understood.

After considerable experimenting the writer has found that the solution patented by Russell and Woolrich consisting of cadmium carbonate dissolved in cyanide of potassium is best adapted for cadmium plating.

For the best results, however, the solution should not contain as much metal as recommended by the inventors; or, in other words, a little more free cyanide should be present. In making the solution, it is best to purchase the cadmium sulphate and convert it into the carbonate form by the use of sodium carbonate. For this purpose the cadmium sulphate is dissolved in water; more water being used than is necessary to dissolve it, in order that the carbonate may settle more readily. A concentrated solution of sodium carbonate is now prepared and added to the cadmium sulphate solution in small successive quantities until all the cadmium has been precipitated as carbonate. When all the cadmium has ben precipitated, the water which contains sodium sulphate should be syphoned off and thrown away. The precipitate is carefully washed by adding clean cold water and again allowed to settle. It should be washed at least three times in order to remove all traces of the sodium sulphate. Cadmium carbonate when newly prepared and in the moist condition is a white powder readily soluble in potassium cyanide. The proper ingredients for the solution are as follows:

Water	1 gal.
Potassium cyanide	5 oz.
Cadmium sulphate for conversion into the carbonate form	2 oz.

THE DEPOSITION.

After the solution is made there is no necessity to add any more metal; the anode will supply all the metal to the solution that is required. A little cyanide dissolved in water should be added occasionally, according to the amount of work that is plated. For anodes the writer has used cadmium sticks suspended from a steel wire. Cadmium of as pure a quality as purchasable should be used, for if too much zinc is present in the anode the deposit will not be as white. It is well to run an iron rod under the solution and suspend the anodes from this rod, in the same manner that is usually followed in silver plating. The steel rod and wire will not dissolve to any appreciable extent. If desired the cadmium may be cast, or it may be easily rolled into sheets and used as anodes in this form. By good management excellent results may be had with a cold solution. There is no necessity to run the solution warm. The best results are accomplished with a solution rather weak in metal and a current pressure of about two volts. The anode surface may be considerably less than the cathode surface. Too large an anode surface or too large a quantity of metal in solution will produce a rather dull gray deposit which should be avoided.

Electro deposited cadmium, when properly produced is white and soft, and it may be given a high polish which it retains in the air about equally as well as nickel. The blue tinge of nickel is absent, and it does not have the gray cast of aluminum. Though it is more expensive than tin, the ease with which it is deposited makes it superior to deposited tin. No practical solution for tin plating that will produce a heavy white adherent deposit of tin has yet been discovered. Then, too, the color of deposited cadmium is considerably denser, takes a higher polish and retains its luster better. When deposited on steel and iron it is far superior than tin plate in rust proof qualities, and is equal to an electro-zinc plate in this respect. Cadmium, of course, can never replace nickel plating for general work; still, from experiments made by the writer, it seems to be more rust proof than nickel as a coating for iron and steel. The higher price of cadmium and the development that nickel plating has received makes it highly improbable that cadmium will replace nickel to any extent. It is likely, however, that in the near future there will be a reduction in the price of cadmium, and the excellent deposits that may be obtained by it will bring cadmium plating into use. The very fact that it is not as white as silver should make it adaptable for antique finishes. It may be that on some lines of work a heavy coating of cadmium would be more desirable than a thin coat of silver. Perhaps its greatest importance to the metal finisher is on work of antique pattern, such as photo frames, door plates, drawer pulls, and similar work. By lightly brushing the deposit with pumice stone and rag buffing the high lights a very desirable finish is produced. Its use has been suggested for plating watch movements, and it would serve well on metal trimmings for yachts and motor boats where nickel is considered undesirable.

Cadmium plate adheres tenaciously, and takes equally well on all metals. No "strike" solution is necessary, and it may be plated directly on steel and iron without previously copper plating. If it is desired to oxidize the surface, this may be done in a black nickel solution. The solution for black nickel plating published on page 291 of the July, 1911, issue of THE METAL INDUSTRY, gives excellent results for this purpose. In this connection it may be mentioned that while it is a rather difficult matter to nickel plate directly on zinc, cadmium may be plated directly with nickel in the same manner as brass or copper. Cadmium cannot be oxidized in a liver of sulphur dip, and in this respect it differs from silver and copper. Arsenic and sulphur dips do not produce a black coating on cadmium, and it is a very difficult metal to color. If exposed to the air, its surface does not become coated with a yellow stain that forms on silver. Cadmium deposits, especially in antique finish should be lacquered in the same manner followed in lacquering silver.

Attempts have been made to plate an alloy of cadmium and silver, but it is unlikely that it has met with commercial success. Such an alloy under the name of "Arcas" plate has been employed in London, with variable results. Many difficulties were encountered in plating this alloy, and the process may have been abandoned. Cadmium cannot be plated from its sulphate solution in an adherent, reguline condition. The possibilities af plating a cadmium and nickel alloy and a cadmium and copper alloy remains to be investigated.

Solutions for plating a cadmium and nickel alloy are said to be used to a limited extent for plating watches, but the writer has never been able to obtain uniform results from such solutions. This may be due to the fact that cadmium does not readily deposit from a sulphate solution, neither alone nor in the presence of nickel.

A more economical way for producing the carbonate is as follows: Dissolve the metallic cadmium in equal parts of strong nitric acid and water. When the metal is all dissolved, add a little more water and bring the solution to the boiling point. It may now be converted to the carbonate form by precipitating it with sodium carbonate in the manner previously mentioned. The precipitate should be carefully washed as directed, when it will be ready for use.

PRODUCTION OF SPELTER.

The United States Geological Survey reports spelter production for the first 6 months of 1911 as 140,196 tons.

LAYING OUT A BADGE DESIGN.

By Lawrence B. Robbins.*

Laying out a design for a badge, emblem or medal is the most important step in its building. The margin cannot be changed, the size reduced or enlarged, or the position changed after finishing without seriously impairing the looks. Place your design exactly where you wish it, allowing proper spacing, and the result is sure to be satisfactory, other things being equal.

First of all, suit yourself that your design is the final cumulation of your ideas. It will save repeated erasings and alterations and insure a much neater and cleaner drawing that would otherwise be the case.

No better impression is conveyed to a prospective customer than to place before him a clean, well handled

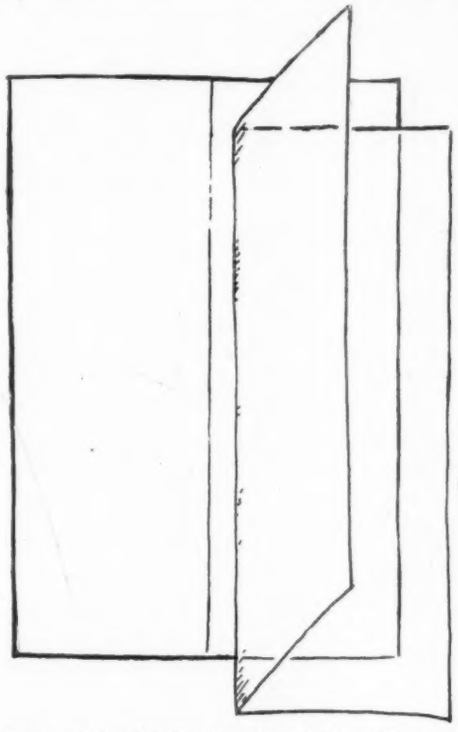


FIG. 1. HOW TO LAY THE TRACING OVER THE DRAWING PAPER .

design, bearing the earmarks of neatness and precision. It is as a well chosen preface to a book.

METHODS.

With this in mind let me refer to two methods generally used to put the idea on paper, so as to make a neat and attractive appearance. The first and most practical one for designs of irregular shape and outline is to draw the design carefully directly upon the paper to be used. In fact, it is the only way for such designs and needs no further comment. For designs of symmetrical outline the tracing-paper method is by far the neatest way to lay out your drawing. While the subject appears simple, yet, as before stated, it is those essentials which in a great measure determine the general appearance of the finished design, and incidentally, its sale.

MATERIALS.

Before proceeding allow me to say a word about materials. I am in favor of using a medium pencil, preferably an H. B. or a B. A hard one will leave marks which no amount of rubbing will entirely efface, while a soft pencil is difficult to handle to advantage, the lines being very liable to smooch. Strathmore board (hot pressed) has always been my choice for paper. The hot pressed has the advantage of being suitable for either wash, water-color, pen and ink or pencil. It is heavy enough to withstand water without bulging, but at the same time is not cumbersome. A very thin tracing-paper is most adaptable to fine work of this nature, but should be purchased with a view to toughness as well as transparency.

*Expert designer, Harwich, Mass.

METHOD OF USING TRACING-PAPER.

The method generally used to lay out designs, as I said before, is to draw correctly your idea on a piece of scratch paper, then transfer to your drawing-paper by means of tracing-paper. But bear in mind this method can

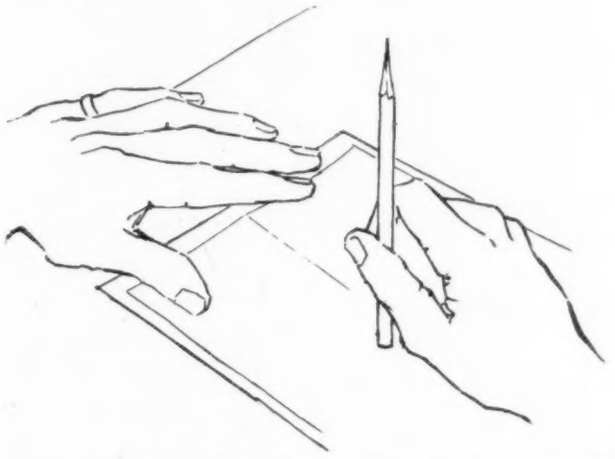


FIG. 2. REPRODUCING THE SKETCH ON THE DRAWING PAPER.

only be used advantageously with *symmetrical* designs; that is, designs which have their opposite sides with exactly the same contour. To proceed, secure your paper firmly to a board or table and rule a light line down the exact middle as a guide line.

Now from the temporary sketch make a careful tracing. When finished, fold down the center, so as to lay one half of the drawing *exactly* over the other (Fig. 1); open and lay face downwards upon the drawing-paper, placing the crease along the dividing line previously drawn. With the back edge of a knife or blunt edge of a pencil rub firmly over the tracing-paper. By rubbing every line, on lifting the tracing, a perfect reproduction will be found transferred to the drawing-paper. (Fig. 2.) No marks will have been made, as the lead is simply deposited from the tracing, and if necessary, erasures and changes can be made without injuring the surface of the paper in the least. When transferred, go over with a sharp pointed pencil and fill in the outline complete, after which the transfer marks may be removed with Art-Gum, or similar agent. Then refinish very carefully to bring out every detail.

The drawing is now ready for its application of pen and ink, wash or water-color, as the case may determine, or may simply be finished in lead pencil. The tracing-paper method can be put to use in a great many other ways aside from that just outlined. If you are working from dies and cutters of some stock patterns you

wish to include, it is much simpler to trace from them by simply rubbing with the blunt end of a soft pencil than to copy by measurement. Cuts, photographs, etc., may also be reproduced exact size by this method. Sometimes it saves work, if you are originating a design to draw only one half of it, trace that half and fold the tracing as before stated, and trace the opposite side from the first.

Again, in even quicker work, paste the tracing-paper (by its edges) over the rough sketch and apply the color directly to it. The result is pleasing, although it has not the finished look of a well worked drawing.

Mention should also be made of laying out a drawing in case tracing-paper is not available. Of course, the use of instruments is necessary to secure the best results. Compasses should be used for all circles and curved lines wherever possible, and all straight lines ruled. Always rule the dividing line through the center of your paper. It centers your design and gives a point to work from. Of course, drawings, and neat ones too, can and have been made without a thought to such preliminaries and operations, but one must admit in this case, "the longest way 'round is the shortest way home" with the average designer, and that is who this article is intended for. System is adaptable to all things. Maybe the reader has methods radically different from mine and can get the same results. Well and good. It's results we are looking for, not poor results but good ones, and the good ones usually spring from a good cause. Provide yourself with good tools and materials and a simple system of laying out your work such as I have here outlined, and you cannot go far from wrong.

THE CORROSION OF BRASS.*

With Special Reference to Condenser Tubes.

By Paul T. Bruhl, M.Sc.†

(Concluded from November.)

THE LOCALITIES OF PITS.

A point of interest and importance is the consideration of the circumstances which go to determine the localities where piting will take place. In the case of 70/30 brass these localities cannot be supposed to depend upon the distribution of any segregated impurity. In fact, as has been pointed out, the presence in brass of free lead or tin, or in fact of any phase besides the *a* phase, would not, *ipso facto*, lead to an increased rate of corrosion, sea water being the electrolyte. The use of acid completely alters the conditions under which the metal is being destroyed. Here no film can form on it, owing to the solvent action of the acid, and the effect of the products of corrosion on the metal—which is of very considerable importance—is altogether lost. Therefore, it follows that in corrosion experiments it would be better not to use an accelerator.

The positions of the more serious pits are probably governed by two factors: the presence of mechanical defects such as "spills," and of certain deposits. Even a comparatively small spill in the tube wall will result, when the cooling water ceases to be pumped through, in the formation of a little reservoir, to which air has complete access. It is precisely under these conditions that corrosion becomes very marked. A brass plate which had been immersed in sea water for several weeks, and which had corroded perfectly uniformly, was then so placed that ¼ inch of the plate stood above the surface of the liquid. In a few days the result was very noticeable; along and just above the junction of liquid and air pitting had occurred, and the metal became quite bright and crystalline in appearance. The direct effect of the reservoir would therefore be an increased rate of corrosion along a contour, which would narrow as evaporation progressed.

The second cause for pitting is the strong electrochemical action set up by certain substances. Of these, ferric hydrate and carbon are probably the worst; and of the corrosion products of brass, the oxychloride appears to be the most injurious. On two or three of the plates small pits were found under the patches of green deposit after the lapse of four months. The location of these patches depends on the roughness of surface. The cause of abnormally rapid corrosion must be due to the presence of stray currents of some magnitude. Corrosion may be accelerated by the interaction of the various products of corrosion, but it is not rapid and local enough to give rise to pitting.

THE EFFECT OF IMPURITIES IN BRASS.

To study the influence of lead, tin, aluminum, and nickel on brass, some alloys were prepared from the purest metals available.

The proportion of copper to zinc aimed at was approximately 75:25, so as to prevent variations in the electromotive forces so far as the copper-zinc content was concerned. Lawrie has shown that the electromotive forces of the brasses from 100 to 75 per cent. copper remain constant, and, therefore, any fluctuation in the electromotive forces of the special alloy can be ascribed to the addition of the third metal. The copper was first melted under charcoal in a coke-fired wind furnace, the zinc was then added, and, finally, the desired addition. After thorough mixing, the alloy was cast in iron molds in the form of plates. The nickel was added as cupro-nickel containing 15 per cent. nitrate. The alloys were rolled with a final annealing at 600 degs. C. for ten minutes. After pickling and cleaning they were weighed and immersed in sea water, the loss of weight from time to time being compared with a standard alloy consisting of copper and zinc only.

Every alloy may be considered to corrode in two stages: the first holding good when the metal is freshly immersed in the corroding liquid, and therefore before secondary reactions occur to any appreciable extent; the second when corrosion or oxidation products have been deposited or formed on the metal. We may accordingly consider that the loss during the first few weeks gives the true effect of the added impurity, although the ultimate effect may be quite different. This is seen in the relative rate of corrosion of Muntz metal and copper. The figures show that the initial effect of 1 per cent. lead and 2 per cent. lead, 1 per cent. tin and 2 per cent. tin, 1 per cent. aluminum and 2 per cent. aluminum, is to increase the resistance to corrosion, whilst that of the nickel alloys is to diminish it.

Unfortunately, the time was not available for a more thorough research along these lines. Such a research is of importance, as it seems to offer at present the only solution to the problem of lessening corrosion. The effects of bismuth, arsenic, antimony, and lead, which are present only to small extents in copper,

*From a paper read at Autumn Meeting, Institute of Metals, New Castle-on-Tyne, England, September 20-22, 1911.

†Bowen Research Scholar, University of Birmingham.

should be studied. Small percentages of lead, for instance, increase the rate of corrosion, whilst additions which result in the separation of free lead retard it markedly. As a sort of general summary, the avoidance of nickel and small amounts of lead, and the introduction of 1 per cent. of tin or 2 per cent. of aluminum are recommended. The effect of iron was not tried, but is in all likelihood an adverse one.

Composition of the Alloys.

Standard: Copper, 74.5 per cent.; zinc, 25.5 per cent.

Alloy No. 2.	Alloy No. 3.	Alloy No. 4.	Alloy No. 5.
Per Cent.	Per Cent.	Per Cent.	Per Cent.
Cu 74.97	75.20	74.12	75.34
Zn 24.09	23.82	24.90	23.78
Pb 0.94	Sn 0.98	Ni 0.98	Al 0.91

Alloy No. 6.	Alloy No. 7.	Alloy No. 8.	Alloy No. 9.
Per Cent.	Per Cent.	Per Cent.	Per Cent.
Cu 74.35	74.85	75.21	73.95
Zn 23.95	23.28	23.87	24.13
Pb 1.70	Sn 1.87	Ni 1.92	Al 1.92

Loss of Weight in Grammes per Square Inch Surface.

Time in Weeks.	Standard.	Alloy No. 2.	Alloy No. 6.
0-1	0.0018	0.0016	0.0014
0-3	0.0058	0.0056	0.0045
0-6	0.0126	0.0119	0.0053
	Alloy No. 3.	Alloy No. 7.	Alloy No. 4.
0-1	0.0014	0.0028	0.0032
0-3	0.0061	0.0035	0.0079
0-6	0.0113	0.0034	0.0129
	Alloy No. 8.	Alloy No. 5.	Alloy No. 9.
0-1	0.0036	0.0019	0.0005
0-3	0.0077	0.0070	+0.0017
0-6	0.0133	0.0112	+0.0012

SOME ALUMINUM BRASSES.

As the aluminum brasses gave such promising results from the corrosion point of view, a few alloys of the following compositions were prepared:

Alloy No. 1—	Per Cent.	Alloy No. 3—	Per Cent.
Cu	74.32	Cu	73.38
Zn	25.21	Zn	25.01
Al	0.47	Al	1.61
Alloy No. 2—	Per Cent.	Alloy No. 4—	Per Cent.
Cu	73.00	Cu	72.85
Zn	25.93	Zn	25.12
Al	1.07	Al	2.03

Alloy No. 5—	Per Cent.
Cu	74.35
Zn	22.60
Al	3.05

These alloys were immersed in an aqueous solution of hydrochloric acid, with the following results:

Rate of Corrosion in 600 cubic centimetres of 5 per cent. HCl. (3 weeks.)

	Loss in Grammes.
Alloy No. 1	5.8775
Alloy No. 2	5.0709
Alloy No. 3	4.8457
Alloy No. 4	4.8237
Alloy No. 5	0.8193

THE NECESSITY OF CO_2 AND OXYGEN FOR CORROSION.

In connection with the necessity of both CO_2 and O_2 for corrosion, a necessity which has been insisted upon by Professor Cohen and others, some experiments were carried out. 70/30 brass placed in a sealed flask of sea water, from which the dissolved gases had been removed by boiling, showed no signs whatever of corrosion after the lapse of several months. In the presence of oxygen only the surface of the metal became oxidized, and there was a slight loss of weight after four weeks, although the solution did not answer the ammonia color test for copper. The loss in weight may have been due to the removal of some non-adherent oxide when the specimen was being washed prior to weighing. The experiment is unfortunately inconclusive, but it seems difficult to understand why the presence of CO_2 should be essential. V. Andstrom working on the rusting of iron came to the conclusion that the porportion of O_2 and not that of CO_2 was the determining factor in the rate of corrosion.

CONCLUSION.

It is again urged that so important a subject as the corrosion of brass by sea water, the neglect of which must mean no slight expenditure, should induce steamship companies to keep records bearing on the subject. It has been this lack of data that has hitherto retarded the solution of the corrosion problem. All the companies with whom correspondence was opened possessed "no definite information."

The conclusions to be drawn from the paper are:—

1. That the presence of air or an increase of temperature up to a certain point accelerate corrosion.
2. That iron, nickel, and small amounts of lead are injurious; tin up to about 1 per cent., large amounts of lead, and aluminum are useful in diminishing corrosion.
3. That the inlet pipe and the condenser plates should preferably be made of brass.
4. That the condenser should be protected against stray currents.
5. Protective coatings are not recommended.
6. The importance of "spills" cannot be exaggerated.
7. That the tubes should be flushed with clean water after use.

Finally, the author very cordially thanks Professor Turner, under whom the research was conducted, for his direction of, and assistance in, the work, and expresses his indebtedness to Messrs. O. F. Hudson and D. M. Levy for their kindly criticism and help in several ways.

At the close of the reading of the paper the chairman announced that the meeting was open for any remarks. The following discussion then took place:

DISCUSSION.

Sir Charles Parsons said that he had inspected some thousands of defective tubes, and it had always seemed to him that the cause of corrosion was some segregation of the material due to impurities. But the subject was very obscure. He did not know whether it had ever been tried, but it had occurred to him that if the tube were formed by enclosing one on another of different metal the corrodible spots might cancel each other out. Bound tubes of that kind, the inner and the outer being of different metals, had been tried for boilers, but had not been successful. He believed that condenser tubes of different metals had been tried, but he did not think there were many instances of this now. Again, tubes might be drawn with insulating material, paper or some other substance between the two layers. If anything could be done to remedy the corrosion of condenser tubes it would be a great boon to engineers. (Hear, hear.)

Mr. A. Anderson (analytical chemist, Newcastle) said that he had been specially interested with the paper, as he and his colleagues had been at work for several years on the subject and had devised a system for the prevention of corrosion, of which many successful installations had been and were being made. The work of Davy was their own starting point, and they made many experiments to ascertain what was the best electro positive metal to employ. Zinc had been found unsatisfactory, both in the laboratory and in practical trials on a large scale, and, therefore, he could not agree with the suggestion on page 13 of the paper. They had found that aluminum and certain aluminum alloys were greatly superior to zinc or iron and maintained the protective action until the metal was prac-

tically all gone, whilst no objectionable deposits were formed in the tubes. That superiority might seem curious, as aluminum stood decidedly below zinc in the scale, but they had had exceptional opportunities of testing the matter, having in several instances successfully installed the system in condensers where zinc had been tried and found to be useless. In addition to fitting protective blocks of suitable material, it was found essential to ensure proper metallic contact between the tubes and the tube-plates, preferable by the insertion of a soft compressible metal grummet between the usual packing and the ferrule. In view of the successful employment of aluminum and aluminum alloys of the electro-positive protective masses he had been much interested in the concluding portion of the paper in which the effect of introducing aluminum into the brasses was described, and it would be of greatest interest to learn how such alloys behaved when tried on the large scale and under practical conditions.

In this connection, moreover, one would like to know what place aluminum hydroxide and oxychloride took when compared with the other corrosion products dealt with on pages 24 and 26 of the paper. This might throw some light upon the remarkable efficacy of aluminum in preventing and arresting corrosion. The experience of his firm fully corroborated the author's statement as to the effect of stray currents and the advantage in extreme cases of providing such with an independent path to earth; in fact, they included this in their 1905 and later specifications under which they were operating. A further means of preventing corrosion suggested itself at once as an extension of the protective block method, and that was to furnish the requisite mild electric current from an independent source. This method had the advantage that the voltage of the electromotive force could be adjusted and varied to suit any conditions, and they were now at work upon the details of the subject. In dealing with condensers it must be clearly borne in mind that this propensity of the tubes to corrosion, quite apart from their composition, varied greatly in degree, and in extreme cases a much more powerful counteractant might be required than in ordinary cases. Further it was much easier to prevent the inception of corrosion than to arrest it when once advanced to any considerable extent (hear, hear), although the latter result they had found to be quite capable of accomplishment (applause).

Mr. G. G. Stoney (Newcastle) said that he had been trying to collect evidence as to whether condenser tubes made many years ago stood better than those made within the last two years. The evidence, as far as it went, was undoubtedly in favor of the former. He was not a metallurgist, and spoke under the correction of the president, but he thought the materials used many years ago were not nearly so pure, and that nowadays electrolytic copper was largely used. With the 70-80 tubes of the old days they got 1½ per cent., or even more of impurities, and yet these old tubes as far as he could make out stood better than the modern ones. Therefore, it seemed to him there was a great deal in what the author said on page 32, that the effects of bismuth, arsenic, antimony and lead which were present only to small extents in copper should be studied. If this were done, as the author suggested, there might be considerable improvements made. He himself was sure that there was some evidence that arsenic was of importance. Unfortunately they (the engineers) were not chemists, and if they sent a tube to be analyzed they simply got the percentage of copper and the rest was put down to zinc. The result was that a complete analysis was both expensive and difficult to obtain. If the tubes made many years ago were taken out and a complete analysis made of them, he thought that possibly some valuable results might be obtained. (Hear, hear.)

Dr. Carpenter maintained that there had been a good deal of electrical investigation of this subject in America, but nothing had come out of that method. The whole of the historical section of the paper as a summary was, he considered, not very accurate, whilst a summary of Mr. Bengough's report in January, in fact, the bulk of it, might have been given with advantage. Dr. Carpenter, having pointed to what he considered to be other defects in the arrangement of the paper and the references to other work, said he thought Mr. Bruhl was very bold in some of his recommendations, which were made on what were really very small experimental foundation, in particular, the reference to the fact that such metals as iron and zinc should not be used as external aids for diminishing corrosion of the condensers. In his (Dr. Carpenter's) opinion there was a great deal of practical evidence showing that there were quite available methods. Mr. Bruhl admitted that his recommendations were quite in conflict with Admiralty practice, and there many years of experience must outweigh laboratory experiments. Mr. Allan, referring to page 30 of the paper, said that if they could eliminate the mechanical defects of the metal they would, in his opinion, have gone a long way towards curing the condenser tube trouble. Professor Louis pointed out that the paper dealt entirely with galvanic action. He was quite convinced that corrosion of brass was not always galvanic. In his own paper that morning, he pointed out that the first thing that happened was that the lead was entirely dissolved out, but if the action were entirely galvanic, the lead would not be the first thing to go. There were innumerable agencies at work, and he had not the slightest doubt that mechanical defects played a very important part. He was quite convinced that if the Alloys Research Committee fixed their minds solely upon galvanic action they would miss a very considerable portion of this very complex subject.

Sir W. White, while believing that they would all respond to the appeal of Professor Turner with regard to it being a student's paper, urged that the object of the institute was not to publish student's work, but to advance knowledge. With reference to what Professor Carpenter had said he hoped that the Publication Committee would consider the matter before the paper appeared in the Proceedings and would edit the paper, while keeping the record of any good work done by this scholar. The author was quite at liberty to make suggestions, but they took them as the work of a student, who was only a scholar in the business. It was a creditable paper for a student, but not one that should appear in its full form in the Proceedings. Professor Turner thought that the reply on the discussion should be deferred until they had had communications in writing, as no doubt they would have and he would like to communicate first with Mr. Bruhl. He himself would be perfectly agreeable to the elimination of such parts of the paper as had been referred to by Sir William White.

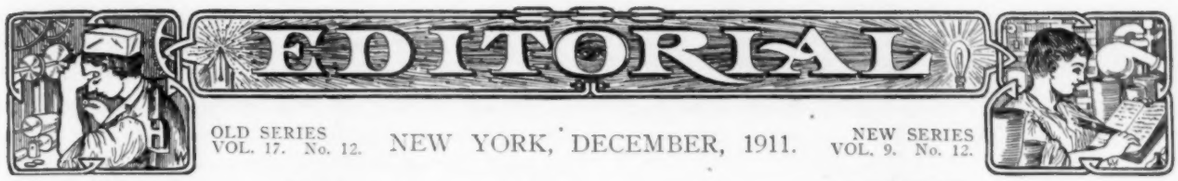
The president explained that the whole of the papers were placed before a committee and referred to selected referees, and if a mistake had been made, it lay with the individual referee. Speaking as a member of the Corrosion Committee, as a tube manufacturer, and as their president, he thought the paper a very desirable one to have before them. (Hear, hear.) It was a good paper, very creditable to a student, and contained a great deal of valuable information and suggestion. The fault he had to find with the paper was that it took too wide a scope and tried to do too much. It took in four subjects, each of which might form the subject of a separate paper and occupy a month in discussion. He thought the suggestion that the paper should be modified before appearing in the Proceedings was a good one, but it was a most useful paper, and he, for one, would not discourage the referees in sending up students' papers. (Hear, hear.) In conclusion, the president asked Professor Turner to convey to Mr. Bruhl the thanks of the institute.

PLATINUM PRODUCTION IN AUSTRALIA.

[From United States Consul General John P. Bray, Sydney.]

Although not one of the chief mineral products of New South Wales, platinum is found in paying quantities. It has been mined in the central portion of the State and the beach sands on the north coast have been treated for the metal.

Up to the end of 1909 the total Commonwealth production was only 11,578 ounces, valued at $100,665, and nearly the whole of it was contributed by New South Wales. Last year 332 ounces, valued at $6,892, were won here. For some years the price of the metal abroad has been rising, until at the end of June, 1911, it had attained the record of $43.50 per ounce. This high price will probably lead prospectors in New South Wales to investigate more carefully the possibilities of platinum mining.



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THE METAL INDUSTRY

With Which are Incorporated

THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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CONTENTS

COPPER

In an address given before the American Mining Congress in Chicago, Ill., on October 25, 1911, Horace J. Stevens, of Houghton, Michigan, recited some very interesting facts and figures relating to copper, its past, present and future. In speaking of the past he stated that one century ago, or in the year 1811, the world's production of copper was a little under 10,000 tons, an amount that was smaller than was produced last year from any one of twenty different mines. Fifty years ago, in 1861, the world's output of copper was but a trifle more than 100,000,000 pounds, a production which was exceeded in 1910 by three large producers. The production of copper for the year 1900, the last of the Nineteenth Century, was just fifty times as great as that of the year 1800. Should the same ratio of increase be maintained during the Twentieth Century, the output of the year A. D. 2000 would be 24,318,150 long tons of copper, or twenty-five times as much as the present production, and even a fifty-fold increase for the Twentieth Century would allow an average increase of less than four per cent., while the average annual increase for the decade beginning 1900 and ending 1910 was almost exactly seven per cent. compounded yearly. Those who foresee a complete collapse in the copper industry would do well to give consideration to the actual figures of increase during the past.

The copper industry does not move forward at even an approximately steady rate, from year to year, but is given to advancing by great leaps, almost inevitably followed by periods of quiesence, or even of actual retrogression. High prices for the metal stimulate production, while, curtailing consumption, and as a direct consequence, output is increased, which decreases prices; which in turn decreases production owing to small operators not being able to stand the strain of low prices.

GROWTH.

Referring to the growth of copper production Mr. Stevens said:

"The growth of the copper industry is best shown by the following figures of the world's production, by decades, in long tons: 91,000 tons in the decade ending 1810; 96,000 tons in 1820; 135,000 tons in 1830; 218,000 tons in 1840; 291,000 tons in 1850; 507,000 tons in 1860; 900,000 tons in 1870; 1,189,000 tons in 1880; 2,373,000 tons in 1890; 3,708,000 tons in 1900; 7,390,000 tons in 1910. The influence of the electrical industry upon the consumption of copper is plainly shown by the figures since 1880. Figures of production and consumption of any given commodity in universal use may differ from year to year, according to whether a surplus is accumulated, or a preceding surplus is drawn upon, but over long-term periods, production and consumption necessarily are the same, and, figured by decades, it is safe to say that the figures of production are practically the figures of consumption. At present there is a copper surplus, of which much is heard, but to show how comparatively unimportant the present surplus is, when compared with the figures of output for the preceding decade, it may be stated that the world's surplus of copper, at the

present time, is slightly less than 300,000,000 pounds of finished metal, or a trifle under 135,000 long tons, an amount less than 5½ per cent. of the total production of the decade, and equivalent to only about eight weeks' supply of copper, at the present time measuring the supply either by productive capacity or by consumptive demand."

With these figures before us it is easy to side with Mr. Stevens when he scouts the idea of some conservationists that, if some methods of curtailment of production are not put into force the supply of copper will be exhausted! The figures as given plainly show that the rate of production has simply kept pace with the steady progress of industrial demands. As commerce has called for an increased supply of the red metal, production has simply increased in due proportion. Copper is after all practically indestructible and when once put into workable form as a metal it might be said to continually endure as a metal. To be sure there is a certain amount of unavoidable waste, but even this waste is nearly all recovered in the final working over of the scrap heap from which large fortunes have actually been made. So much progress has been made in the smelting processes of the copper ore, that the same methods used to win the copper from the ore, to the last tenth of one per cent., are now applied in recovering the last traces of copper from what was formerly regarded as waste.

Here again electricity, the wonderfully versatile ally of mankind, has been called into play and we find that now the greater portion of the copper sent to the world's markets is refined electrolytically and conversely, our great electrical refining plants take the refuse of metal industries of all kinds and recover the copper!

CONTROL OF COPPER.

In this connection, after giving a very interesting recital of attempts to corner or control the production of copper and subsequent increase in price. Mr. Stevens says:

"The tendency in copper mining, as in all other branches of industry, is toward combination in ever-larger units. This tendency is based upon and governed by purely economic laws, and the laws of political economy are so much stronger than any law ever devised by a parliament, or any ukase ever promulgated by a despot, that it requires no spirit of prophecy to forecast the ultimate outcome of the present clash between the laws of political economy and the laws of congress."

The author ends his interesting discourse by criticising the actions of the Government to restrain combinations and mergers and cites how all efforts at copper corners have been uniformly unsuccessful. While this may be true of copper owing to its abundance it is not true of other metals and materials and even in our issue of last month we mentioned the corners that were taking and had taken place in tin, fusel oil and amyl acetate with the consequent harm to the metal industry in general.

That corners in raw materials are possible in this day of combinations and operations of capital is a self evident fact and the spirit of the times is for the Government to control these mighty combinations that they may not abuse their powers. Likewise the spirit of the times is to conserve the natural resources, using what is necessary, reproducing wherever possible that the nation's natural wealth may not be wasted. No better evidence could be cited that the intelligence of the country believes in these principles than the recent opinions of a number of captains of industry who during the past month have expressed freely in the public press the need of a Government business or industrial court to govern the manufacturing and commercial problems of the times. We herewith quote the opinions of one of the greatest industrial captains in any age—Andrew Carnegie—who in a published interview said:

"In my opinion there is only one way of protecting the consumer, and that is through an industrial court, with power to investigate and fix a maximum price from time to time beyond which no concern, large or small, is permitted to go. They have successfully done this in the whole railway system, and we can do it just as easily in the industrial system."

It is very probable that if this wise opinion were followed by the Government the country would be blessed with less business disturbances and more industrial peace.

ALUMINUM BRONZE

Every once in a while we are informed either by daily and trade press or by individuals, that a new process has been discovered for the production of a new metal which rivals gold in a great many characteristics, but the cost is trifling when compared with its noble prototype. Upon investigation we find the new metal to be our old friend aluminum bronze with a new name. Aluminum bronze has had its day and manganese bronze has almost completely taken its place. There is no doubt but what some of the alloys of copper and aluminum, notably the five and ten per cent. bronzes, have very many commendable qualities which recommend their use in commercial products. Some fifteen years ago thousands of dollars were sunk by a foundry company in New England to manufacture and exploit aluminum bronze. THE METAL INDUSTRY has from time to time published numerous articles describing the manufacture of the aluminum bronzes in many phases. After long periods of experimenting it has always been discovered that there was a weak point in the armor of the bronze. This was found to originate in the initial preparation of the alloy and it was finally decided that the cause of the trouble was oxide of aluminum formed when the metals copper and aluminum were melted and mixed together. To mention the different expedients used to overcome this formation of oxide would be to give a list of all the known deoxidizing agents known to metallurgists. We believe that nothing has yet been discovered that will effectually reduce the aluminum oxide and it is extremely difficult to prevent the initial formation of the oxide. We may be able to prevent it in a limited degree, but not in ordinary commercial foundry practice.

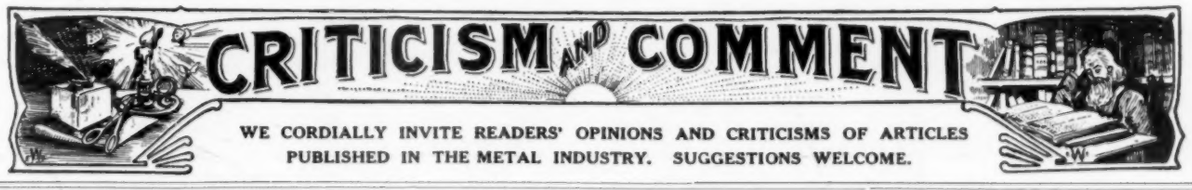
Among the notices of current patents in this issue of THE METAL INDUSTRY will be noted one granted to H. G. Durville, of Paris, France. This patent covers the use of manganese as a deoxidizer in the manufacture of aluminum bronze. This does not strike us as being anything new for we are acquainted with attempts to use this material in the form of manganese copper for this purpose some ten years ago. The results of the experiments in

question were not satisfactory for reasons which will be explained. Manganese does act as a deoxidizer under certain conditions, but it was our experience that the aluminum got ahead of it and oxide of aluminum was always formed first and the mischief was done. The reason is simple, aluminum is in itself an excellent deoxidizer and therein lies the reason for the failure to produce good and sound aluminum bronze in commercial quantities with minimum loss and of uniform homogenic composition. When it is realized with what difficulty aluminum is induced to give up its oxygen; when we study the details of Hall's process for the production of aluminum from bauxite and other aluminum bearing ores we can readily see how futile it is to attempt to reduce aluminum oxide to metallic aluminum in a crucible of molten metal by the simple addition of some substance known to have a certain affinity for oxygen! Our added substance may be an excellent deoxidizer for some metal, like copper, but in the case of aluminum only acts in a very limited extent and generally not all!

When we add the metal aluminum to molten copper the aluminum takes up the oxygen ahead of any other known substance and the oxide formed is entangled in the alloy formed by some of the aluminum and the copper and cannot be gotten rid of! This alloy, upon being rolled and reduced to thin sheets and wire, will inevitably be found to be full of minute flaws and specks and rejections of finished material must follow. It may be possible with the development of the electric furnace to make a commercial alloy of half copper and half aluminum. This alloy could then be used to introduce the necessary amount of aluminum into a five or ten per cent. bronze.

THE CONVENTION SITUATION

The convention situation is gradually clearing by the announcement that the various foundrymen's associations will meet in Buffalo, N. Y., as originally planned. The date will be in the month of June, 1912. The exhibition company have made no official announcement as yet where they will go, provided they cannot secure a suitable exhibition hall in Buffalo, and up to the time of our going to press they had not been successful. All of the parties interested in convention planning are working diligently to solve a rather difficult problem.



ONE PLATER'S PLAINT

The supply of platers, polishers, finishers, etc., increases every day with a corresponding decrease in the number of shops to work in. What shall be done to bring back to the trade conditions that existed only a few years ago? At the present time everybody is jealous of each other's job and all are competing for the same position. The writer has looked deeply into the existing conditions and can give some facts as to the causes of this fierce competition and subsequent misery in an industry that requires hard study of all the details of the technicalities attending it, and he also offers a suggestion as to how to improve it. As a result of the writer's observations he has come to the conclusion that the principal cause of the trouble existing in the finishing trades today is the head plater himself. In the average shop the plater has supervision not only over the electroplating of the work, but also over the polishing, burnishing and lacquering. This head plater is very often running what is known as a job plating shop, and he has several helpers working under him learning the business. The boss plater finds it cheaper to employ green hands and teach them the details of the business rather than to engage the services of an experienced plater, finisher, etc. After the boss plater has educated a helper to the point where he is competent to perform a certain portion if not all the work coming into that particular shop, it usually happens that the helper will go to headquarters and solicit the position of his teacher. If this does not happen in the same shop, we find the quickly taught helper as an applicant for any open position that is being sought for by older and experienced platers. As business concerns are usually engaged in an industry for financial reasons they naturally are looking for the lowest bidder. This condition holds true at the present time not only regarding materials, but also as to employees and the quondam helper is usually the successful applicant for the open position, leaving the experienced man in want of work.

The writer has had actual experience in this connection. It was discovered by him that the firm employing him as a foreman plater had actually paid the expenses for a helper, working in the same shop, to attend a class at one of the technical trade schools and was being taught by an experienced plater. In due time the helper took the position of the writer, and there was then a plater out looking for a situation. The writer's solution of the problem is as follows: Let all the platers cease to teach their help and do not allow them to help to work the solutions, other than to hang the work in, unless the helper happens to be a plater himself. Stop the teaching of plating, polishing and kindred phases of the industry at technical schools and confine the details of the trade to foremen platers alone; in other words discourage rising young men from entering the metal finishing trades for a certain period of time. In this way the supply of platers will soon become diminished and the demand thereby increasing, the standard of wages will be raised and the trade will once more be upon a firm financial basis. The writer is aware that many will attack this suggestion, but he would like to see a discussion started and other remedies suggested.—A PLATER.

"The Metal Industry" would like to hear expressions of opinion and suggestions in reply to this one plater's cry.—Ed.

SOFT SOLDER ANALYSIS

To the Editor of THE METAL INDUSTRY:

My friend Mr. V. Rostow, of Brooklyn, N. Y., has called my attention to an error in Rule 4 of the note to the article, "Rapid Analysis of Soft Solder," in the November issue of THE METAL INDUSTRY. The rule should read: "Divide the weight in air by this remainder," etc., instead of "Divide the weight in water by this remainder," etc. WM. P. MUNGER.

Rochester, N. Y., December 6, 1911.

GALVANIZING AND SHERARDIZING

To the Editor of THE METAL INDUSTRY:

My attention has been drawn to an article in your October issue headed "Galvanizing Wire in Zinc Dust," by Alfred Sang. As the inventor of the process of galvanizing with zinc dust, known to the trade as Sherardizing, I should like to point out that the method of galvanizing wire by heating it by an electric current, and passing it through zinc dust was suggested by me and experimented with long before Mr. Sang became acquainted with the process. SHERARD COWPER-COLES.

London, November 16, 1911.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—Will you please publish a good mixture for acid resisting gun metal for pumps and valves for chemical works. I am also trying to use up a quantity of old brass, but cannot get it to mix very well; will you advise me what to do and what flux to use?

A.—A good mixture for the work you mention is the following:

Copper	10
Lead	2
Tin	¾
5 per cent. phosphor tin	½

It should be well alloyed and poured at a low heat. The old brass you are trying to use is evidently very miscellaneous and unless you can classify it, it is only suitable for making car brasses or other inferior work.—J. L. J.

Q.—What is the best composition for bowling up spoon bowls and fancy pieces in sterling silver?

A.—Use an alloy of lead and antimony according to the hardness you require. A mixture of lead 86 parts and antimony 14 parts should answer your purpose, but by increasing or decreasing the amount of antimony the hardness in like manner can be increased or decreased.—C. H. P.

ASSAYING

Q.—We have been making some bone-ash cupels, and we mix finely ground bone-ash with water in which is dissolved carbonate of potash. When dry, and when made red hot they crumble to pieces. The color of them when dry is white, but those we buy are light brown, and when red hot do not crumble. Can you advise us on the matter?

A.—Your trouble is probably due to using too great an amount of solution and then imperfectly drying the cupel. Then when it is heated to a red heat the escaping steam causes it to crumble. Try drying at about 85 degrees C. for several hours, and then at 105 degrees C. until absolutely dry, and store in a dry place. The cupels you buy probably contain some iron oxide, and that gives the brown color mentioned, but it is doubtful if it is added intentionally.—J. L. J.

CLEANING

Q.—Kindly tell us the best method for cleaning sand stains and other discolorations from the inside of aluminum tea kettles, etc., so as to leave them clean and white.

A.—After removing the sand from the surface in the regular mechanical way, prepare a solution, which should be used warm, consisting of 8 ounces of caustic soda in each gallon of water. Immerse the castings for a few seconds in the above solution; then rinse in cold water. Now immerse in a mixture consisting of four parts of aqua fortis (38 per cent.) and one part of oil of vitriol (66 per cent.) for a few seconds to remove the oxide of aluminum, formed by immersion in the caustic soda solution. This will give you a white surface. After the acid immersion rinse again in cold water and then immerse in boiling water and dry out by the aid of maple sawdust.—C. H. P.

COLORING

Q.—I oxidize watch cases by dipping into a solution of potassium sulphuret with ammonia, but the color is grayish. How can I obtain a deep black color?

A.—The gray color of your watch may be due to the scratchy appearance of your polishing. This shows up gray on account of the lines that are not removed in the final polishing. After you obtain a higher finish and the color is still gray give the cases a light coating of silver after the copper plating, and then reflash in the copper bath and use your sulphuret a little stronger and cold instead of hot. Many manufacturers do not polish their cases, but sand blast them; then coat lightly in nickel and plate in a special black nickel solution, using a very low current. This gives the appearance of the gun metal finish, so much admired upon imported Swiss watches that are sold so cheap.—C. H. P.

CUTTING

Q. How should box-tool blades be placed in the same and ground above or below center for cutting cast brass?

A. The blades in box-tools for cutting brass should be always on a dead center. When using for cutting soft annealed tubing or Tobin bronze, a lip cut on the blade makes it cut free and does not choke.—P. W. B.

DIPPING

Can you give us an acid dip for bronzing small G. M. valves, steam cocks, etc., say up to two inches?

A.—Use an acid dip composed as follows:

Yellow aqua fortis, 38 per cent.	2 gals.
Sulphuric acid, 66 per cent.	1 gal.
Muriatic acid	2 ozs.
Water	1 qt.

Mix and then allow to cool; cleanse the valves if greasy with hot caustic soda solution; then wash in cold water and immerse in the acid dip for a few seconds; remove, wash in cold water and then immerse in a cyanide dip, consisting of two to four ounces of cyanide of potassium to a gallon of water. Then rewash and dry out by the aid of boiling water. If the color from the acid dip is not high enough repeat the operation, the color will then be satisfactory.—C. H. P.

FINISHING

Q.—We are sending you a sample of cloister finish. Would you kindly let us know how to obtain this finish?

A.—The sample which you term the cloister finish is nothing more than what is known as a dark Japanese bronze finish. To prepare this finish, if the articles are made from brass, it is necessary: First, to copper plate the articles in a regular cyanide of copper solution for fifteen minutes to half an hour. Second, after plating, wash in cold water and then scratch brush, using a soft wire brush for the purpose. Third, after brushing, cleansing again in the usual manner, the articles immersed in the coloring solution, which should have been previously prepared and consists of:

Sulphuret of ammonia	¼ oz.
Sulphuret of potassium	1 oz.
Water	1 gal.

Immerse the articles until a dark-brown tone or a nearly gun metal tone is produced, then remove quickly, wash, dry out by hot water and sawdust. Then brush the surface lightly, using the same method as above, only the brush must be perfectly dry for this operation. In the previous operation it should be wet, using clean water to which is added a small piece of common washing soda to soften the water. After the proper tone is produced the article is lacquered in the regular manner. A little experimenting may be necessary; if the tone is too dark reduce the solution with water or decrease the time of immersion, which should be only a few seconds. If the color is too light, use the method vice versa.—C. H. P.

LUBRICATING

Q.—Kindly advise us what you consider a good formula for plugs or keys of ground key stop cocks, used on steam, gas and water. Something that will make them turn smoothly and not discolor the brass. We have been using a mixture of graphite cock grease and it is not satisfactory, as it seems to dry out.

A.—Try the following formula:

Beef tallow	2½ lbs.
Best grade bees wax	2½ lbs.
Lard oil	2½ lbs.
Lana oil	2½ lbs.

Melt beef tallow and strain first, then cut up bees wax and thoroughly dissolve same in the tallow; then add the oils and cook same for ten minutes, stirring so that the ingredients will thoroughly mix; pour out in cans and cover when same is ready. There are two methods of applying same: either with a small paddle in a stiff condition, or remelting same and keeping at a low temperature and applying with a fine-grade brush on the key, which enables it to spread well.—P. W. B.

PLATING

Q.—My copper solution does not plate freely. It stands at 22 degrees Baume, and I use dry carbonate of copper and cast anodes. Can you suggest a remedy; also please publish a standard formula for a copper solution.

A.—Reduce your copper solution with water to 12 or 15 degrees; then add two ounces of bisulphite of soda to each gallon. Save the solution so removed and add again as the solution becomes reduced in volume by use. This should overcome your trouble. A standard copper solution should consist as follows:

Cyanide of potassium	6 ozs.
Carbonate of Copper	3 ozs.
Bisulphate of soda	2 ozs.
Water	1 gal.

If necessary add a little more free cyanide when the solution is in action for a day or two, say one ounce to the gallon.—C. H. P.

Q.—I am enclosing two ornaments and would like to know whether it is possible to put 3½ grains per dozen pieces on the one and seven grains per dozen on the other, and have them come out of the 24K solution bright and clear, so as to do away with polishing. The pieces are polished on the front only before plating. What is the best method for getting on the correct amount of gold?

A.—It appears to us that you should be able to get a gilt finish with the amount of gold specified. The articles must be highly colored and free from stain before gilding. The salt water method of gilding would appear to us to be the proper method to use on account of the uniform current developed, which would be required for the small amount of gold deposited. Very much of this class of work is being polished by the steel ball method after gilding; but repolishing in any form should not be necessary with a correct solution.—C. H. P.

Q.—Can I run a plating shop without a volt meter if I am there all the time to look after it, and how are connections made from dynamo to voltmeter to tank?

A.—Certainly you can run a plating department without a volt meter, providing your dynamo produced the required amount of energy. Plating rooms were run for years before the voltmeter was invented, and many are now being run without them at the present time, but it is like trying to determine the time without a clock. You may guess that you are getting a sufficient voltage, but you are not sure, and as a clock will determine the correct hour, so a voltmeter will determine the correct pressure in volts of your dynamo. The voltmeter can be arranged in either the positive or negative line by connecting a wire of sufficient size from either of these poles to the voltmeter and then to the proper tank rod. A series of tanks can be connected in this manner by using the switch arranged on voltmeters for operating a number of tanks at the same time.—C. H. P.

RECOVERING

Q.—Kindly let me know through THE METAL INDUSTRY the best method to recover silver from a fire dip of nitric acid.

A.—Precipitate the silver in the form of a chloride by adding muriatic acid as long as a precipitate is formed; then filter the chloride of silver from the residue. This should be washed several times in the usual manner. Afterwards cover the precipitate with equal parts of muriatic acid and water; then add sheet zinc, exposing as much surface as your receptacle will allow. The action of the zinc will precipitate the silver in the metallic state due to the evolution of hydrogen. The action should be continued until no more silver is precipitated; then remove the zinc, syphon off the clear solution, which is chloride of zinc, and may be used as a soldering flux. Then add hot water to the precipitated silver a number of times to thoroughly free it from the acid. When dry it can be melted in the regular manner using borax as a flux.—C. H. P.

SOLDERING

Q.—Will you please publish in the columns of THE METAL INDUSTRY a recipe for a very easy-flowing, soft solder, such as used for repairing pewter tea pots, etc. The half and half solder which we have been using is too hard.

A.—To make an easy flowing solder for Britannia ware, melt together tin, 2 parts; lead, 1 part; bismuth, 1 part in a small black lead crucible. Pour into slender sticks. Use powdered rosin as a flux.—J. L. J.

TINNING

Q.—Will you kindly give me the formula for a cold electro tin solution?

A.—Use the following proportions:

Fused chloride of tin	4 ozs.
Sal ammoniac	2 ozs.
Water	1 gal.

Use anodes of pure tin. The current should be properly regulated so that a pulverent deposit is avoided. The above formula is a very simple one, but it will be found to give good results. —C. H. P.

Q.—Please give us formula for process of tin dipping, such as is used on spoons, knives, forks, etc.

A.—The process of tinning knives, forks and spoons consists as follows: An iron furnace should be arranged in brick with suitable firebox and sheet metal hood to carry away fumes. The kettle should be at least fifteen inches long, eight inches wide and six inches deep. The articles are usually rolled in tumbling barrels with scraps of leather to produce a bright and smooth surface. After tumbling the articles are cleansed with a hot potash, then washed in cold water and immersed in a solution consisting of equal parts of muriatic acid and water. After this immersion dip in a concentrated solution of chloride of zinc. This solution can be prepared by saturating muriatic acid with scrap zinc until no more is absorbed by the acid. The articles are now ready for the first tinning. Iron wire mesh baskets are usually used for the purpose, or specially prepared frames. After the chloride of zinc dip, the articles are immersed in the molten tin. When coated, the articles are removed and shaken quickly to throw off the excess of tin.

To finish the goods a second bath should be arranged, which can be considerably shorter in length. Upon the finishing tinning bath beef tallow or cocoanut oil should be used as a covering to the depth of one-half inch. The previously tinned articles are immersed in this bath until the heat of the tin is reached, then removed and allowed to cool for a second, so that the tin will not run in lumps. Finish by wiping the articles in a cheap wheat flour. Pure Straits or Malacca tin give the brightest coating. Some concerns to cheapen the coating use a certain percentage of lead. Tin furnaces can be heated by coal, coke or gas.—C. H. P.

PATENTS

REVIEW OF CURRENT AMERICAN PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

1,007,069. October 31, 1911. Treatment of Iron or Steel to Prevent the Oxidation or Rusting Thereof. T. W. Coslett, Birmingham, England.

According to this invention the iron or steel is subjected to the action of phosphoric acid in the presence of zinc or a suitable zinc compound, or to the action of a solution of the latter in phosphoric acid, or to the action of acidulous zinc phosphate. Zinc, zinc oxid or zinc phosphate may conveniently be used for this purpose, and the solution obtained by the action of the phosphoric acid upon the same is preferably made in a concentrated condition. The concentrated solution obtained may afterward be separated from any sediment or excess of zinc or zinc compound that may be present and then be applied directly to the iron or steel articles for a short time, or be diluted with water to any desired extent before the iron or steel articles are immersed therein or treated with it. Or the strong solution may be applied direct to a surface on which a deposit has been obtained by action of dilute solution.

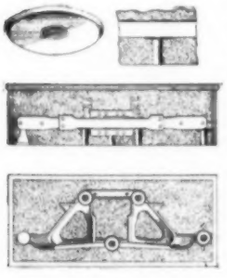
A suitable formula for preparing the concentrated solution may be as follows, comprising the ingredients given in or about the proportions stated:

Zinc	6 oz.
Phosphoric acid	1 pint.
Water	1 pint.

Heat may or may not be employed as an aid in dissolving the solid portions of the ingredients.

1,007,458. October 31, 1911. Means for Eliminating Risers on Castings. R. P. Lamont, Chicago, Ill.

This invention relates to the art of casting molten metal in molds and has particular reference to an apparatus for producing castings of steel or other metals without the usual "risers" on the solidified metal. It is, of course, necessary in order to prevent the occlusion of gases within the molten metal and the consequent weakening of the casting that free exit for the gases should be provided. This object has not hitherto been completely obtained in practice because in order to prevent the waste of metal and also the increased cost of removing the sprue or riser from the casting it has been customary to restrict both the number and area of the escape apertures as much as possible consistent with a fairly free vent for the occluded gases.



The invention proceeds upon the theory of providing adequate and ample escape for the gases, and this is done by making the vent, as shown in cut, of practically uniform cross section from end to end and then embedding in the wall of the mold at the inner end of the escape opening a perforated body of silicious material, the area of the perforations being adequate to permit the free escape of the gases while the material constituting the perforated body coming in contact with the hot metal will chill the latter and prevent its rise within the cavity.

1,007,548. October 31, 1911. Aluminum Bronze. P. H. G. Durville, Paris, France.

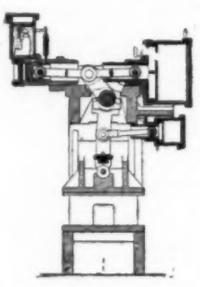
The alloys forming the subject of this invention are characterized by the addition of manganese, which plays the part of a purifier. These alloys are of the following composition: Cu 86-95%, Mn 0.05-5%, Al 6-11%. The metals can be melted in the order indicated above, but a portion at least of the manganese must be added in the form of an alloy with copper, or with aluminum, at the time of casting. Manganese in small proportions plays the part of a purifier as regards impurities other than oxids, which are not removed from the alloy by aluminum. The greatest proportion of manganese, up to 5 per cent., in addition to the part hereinbefore indicated, increases the hardness and the malleability of the alloy.

The patent covers the following claim:

Aluminum bronze comprising about the proportions of 86 to 95 per cent. of copper, 6 to 11 per cent. of aluminum, and 5/10 to 5 per cent. of manganese.

1,007,792. November 7, 1911. Press. F. Ortin, New York, assignor to E. W. Bliss Company, Brooklyn, N. Y.

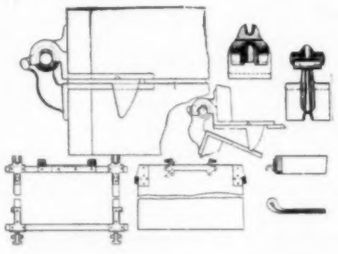
This invention relates to power presses such as are used for various metal working operations, such as punching, stamping, drawing or the like, which instead of being driven my mechanical power are operated by fluid pressure. For certain purposes and in certain locations it is more convenient or desirable to drive presses for such purposes by fluid pressure than by belting from a power shaft or by an electro-motor. The invention aims to provide a practicable press, shown in cut, wherein the operation is divided between two cylinders and pistons, the one of smaller area giving the preliminary stroke, and the one of larger area affording the final or working stroke.



One feature of improvement resides in such correlation of the preliminary or auxiliary piston with toggles or equivalent mechanical intermediaries as affords a rapid preliminary stroke which at its termination leaves the parts solidly reinforced against a strong resistant portion of the frame of the press, whereby the more powerful movements effected by the larger or main piston is brought to bear against an adequate abutment for receiving the reactive thrust of the working stroke.

1,008,221. November 7, 1911. Molders' Flask. D. T. Turney, New Albany, Indiana.

This is an improvement in molders' flasks, as shown in cut, and more particularly to the hinged mechanism for that type of a flask with which match-plates are used. The object of the present invention is to provide an improved hinge to co-act with the match-plate to prevent the jarring of the sand in the cope section of the flask when the same is hinged back to substantially a vertical position upon the drag.



Further objects of the invention are to provide means upon the flask to prevent the dropping of the cope when the same is being raised until the mold therein has cleared the pattern on the top side of the match-plate.

To provide means upon the match-plate for gradually lowering the pintles upon the cope section of the hinge into an elongated bearing upon the drag section of same.

To provide a locking hinge upon the flask whereby the cope is locked to the drag against displacement when the cope is in a raised position.

To provide means upon the flask hinge for supporting the cope in a substantially vertical position upon the drag.

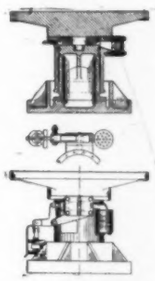
Finally a further object of the invention is to provide upon the hinge, members for simultaneously locking and supporting the cope upon the drag in a raised position.

1,008,254. November 7, 1911. Process of Briquetting Metals Containing Copper. M. Glais, Vienna, Austria-Hungary.

This is a process for the briquetting of metals containing copper, such as shavings and the like, and is based on adding to the mass suitable agents which form with the cupric oxid of the briquetting material a compound which decomposes readily in heat, cupric oxid being separated in a state of fine division. This has proved to be in this state a good binding agent for cupreous material.

One mode of carrying the process into practice is as follows: The metal to be briquetted is first treated with ammonia, which may be employed in form of an ammoniacal solution so that all the parts are covered on their entire surface as uniformly as possible therewith; the treated material is then subjected to the pressure and subsequently heated. Instead of ammonia, ammonium carbonate solution can be advantageously employed, a 3-6% solution being preferably used. Quicklime is then added to the treated material and the briquets are exposed to the air after they have been pressed. Owing to the admixture of lime it is superfluous to heat the mixture artificially for the purpose of starting the chemical process, because after the pressing operation the mass heats spontaneously in consequence of the slaking of the quicklime. In this process ammonia is likewise formed which forms with the uniformly distributed cupric oxid of the metal mass a blue solution of cuprammonium, which is distributed uniformly in the material to be briquetted. In consequence of the heat of absorption constantly produced owing to the slaking of the quicklime, cupric oxid is then separated which is very finely distributed in the material to be briquetted, and has an agglutinative action on the individual metallic particles of the same. In this process there is produced simultaneously with cupric oxid calcium carbonate in addition, which likewise is a very good agglutinant.

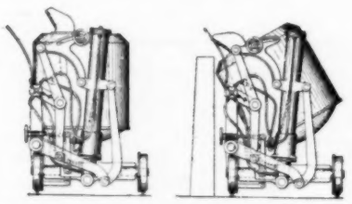
1,008,299. November 14, 1911. Machine for Jarring Molds. H. R. Atwater, Cleveland, Ohio, assignor to the Osborn Manufacturing Company, Cleveland, Ohio.



The machine shown in cut and constituting the present invention may be regarded as an independent jolting stand, or as a filling stand adapted for use with a rock-over or other similarly operative type of mold making machine, since the essential features of construction will be the same, irrespective of whatever the machine be thus used as a plain jolt molding machine or a rock-over jolt molding machine. The jolting stand form, presenting the simpler construction, has been chosen for illustration in the present connection. The object of the invention is to provide a machine of the character in hand that will be capable of giving any required length of stroke and any required compression under the blow, with any air pressure that will operate the machine.

1,008,406. November 14, 1911. Portable Furnace. M. Davis, Watertown, N. Y., assignor to J. B. Wise, Watertown, N. Y.

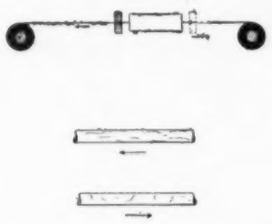
The object of this invention is to provide a tiltable and rotatable furnace (shown in cut) for melting metal, which may be readily transported from place to place, and which carries its own heating agent. A further object is to provide a furnace which is adapted for pouring the molten metal directly into the molds, without disturbing the fire, or requiring the rehandling of the metal. A further object is to provide a plurality of simultaneously actuated hoisting devices for supporting and elevating the furnace.



A further object is to provide adjustable means for varying the axis upon which the pouring spout of the furnace rotates, so as to deposit the metal at different points successively, without disturbing the furnace or its operating parts. A further object is to provide simple means for effecting the automatic raising of the pouring spout during the final pouring operations, for the purpose of "feeding" the molds. And a further object is to provide means capable of manual, and also automatic operation, for controlling the hoisting devices.

1,008,808. November 14, 1911. Method of Drawing Fine Wires of Refractory Metals. Karl Farkas, Glen Ridge, N. J.

This patent covers a novel method of drawing fine wires or filaments from rods or relatively heavy wires of refractory metals such as tungsten, for instance. These very fine wires or filaments are used as incandescents or illuminants in the drawn wire filament lamps.



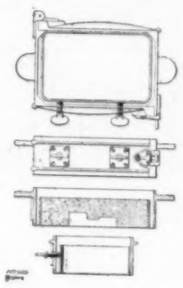
One feature of the invention is that the wire which is drawn repeatedly through dies, as shown in cut, having various openings, is drawn first through one die in one direction and then through another die with finer bore in the opposite direction, whereby the strain exerted on the wire by the first drawing out of same is counteracted or counterbalanced. The slight irregularities or microscopic defects produced by drawing the fine wire in one direction are removed by drawing the same wire in the opposite direction, thus making the wire dense and regular.

The operation is covered by the following claim:

The method of drawing fine tungsten wire consisting in heating it electrically in an atmosphere of hydrogen, drawing out the heated wire in one direction, heating it electrically again, and drawing the heated wire out to a finer degree in the opposite direction.

1,008,943. November 14, 1911. Snap Flask Device. L. A. Boss, North Braddock, and Wm. J. Reardon, Wilmerding, Pa.

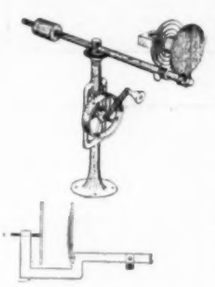
This is a snap flask device shown in cut which is covered by the following important claims:



A snap flask device comprising a pair of L-shaped bars arranged to provide a rectangular inclosure, means for hinging one end of one of the bars to one end of the other of the bars, a bifurcated latch and a keeper carried by the other ends of the bars and adapted to engage with each other to detachably couple the free ends of the bars together, a frame mounted in the inclosure, outwardly projecting handles carried by the bars, and adjustable means carried by and extending through one of the members of a bar intermediate the ends of the member and engaging with one side of the frame for clamping the latter against the opposing member of the other bar.

1,009,167. November 21, 1911. Centrifugal Casting Machine. George S. Monson, St. Paul, Minn.

This invention relates to improvements in centrifugal machines for casting metals, its object being to provide improved apparatus wherein the flask holder is adjustable to flasks of different sizes, wherein the rotating parts are kept in balance, and wherein the metal is guided and driven into the flask the most direct and efficient way. Referring to the cut:



The flask holder consists of two upright abutment plates, either one of which may be adjusted toward or away from the other. In the preferred embodiment of the invention the holder consists of an outer plate fixedly secured to a bar, and an inner plate sleeved thereon so as to be movable toward and away from the plate. It is held in adjusted positions by means of a set screw. The outer plate is flat on its inner face, while the inner plate is formed with a plurality of annular steps or shoulders arranged at progressively increasing distances from a central opening through which the metal is cast into the flask.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

BRASS WORKING TURRET LATHE

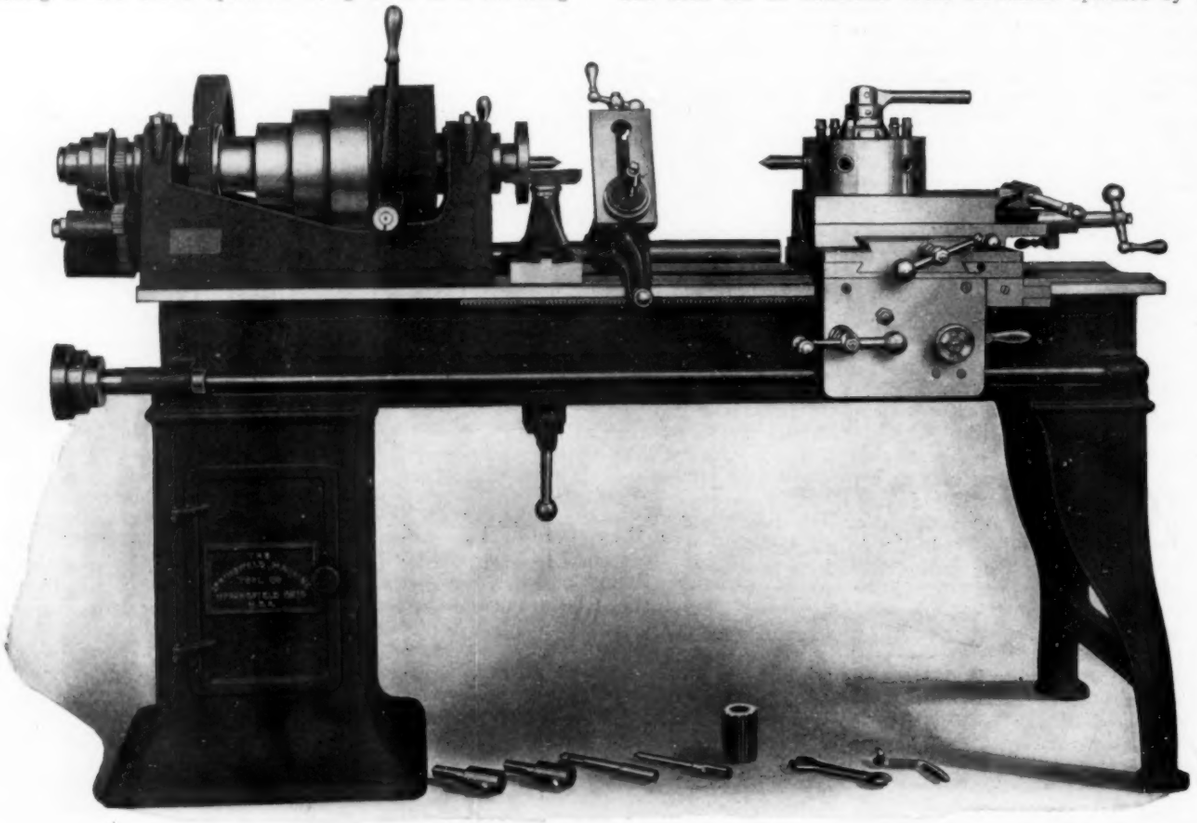
The lathe shown in the cut is manufactured by The Springfield Machine Tool Company, Springfield, Ohio, and embodies some radical improvements on the older styles of lathes. These improvements are particularly noticeable in the turret head, the clutch mechanism making it capable of being handled much quicker than the old style—a feature which will be particularly interesting to brass workers who are always on the lookout for machinery to cheapen their product. The turret is designed that one slight backward movement of the blade loosens the turret and at the same time withdraws the locking pin; while a slight forward movement produces the fractional revolution of the turret for the next tool, and at the same time locking and tightening it—the entire operation being done in a twinkling and with one hand. This machine is also furnished with a new feature, whereby left-hand threads may be cut with right-hand leaders, thus saving the cost and annoyance of a separate set of left-hand hobs and leaders. Four step cone of large diameter, and is strongly back-geared. The spindle is made of high-grade steel, accurately ground, and has 1 1-16 inch hole through the same. The journals are of phosphor bronze.

The front bearing of chasing bar may be moved along the bed by means of tongue and groove to accommodate position of chasing head when operating on work held in chucks or between centers. The different pitches of threads are obtained by the well-known follower and leader device. One leader and follower to cut 11½ threads per inch, also one hob to cut follower, go with each machine. Straight or tapering threads may be cut, and the change from one to the other made quickly. Inside boring and tapping can be done while outside taper work is being performed.

The turret is provided with automatic engine feed, with three changes, which may be reversed by the handle at the left-hand side of apron, and directly at the hand of the operator. There is also a longitudinal movement by either lever or screw. The top slide rests upon a slide having a right-angle hand movement operated by a screw to front of machine, allowing a large range for facing off work held in chuck. When using this hand set-over, the holes in turret can always be brought central with spindle by a positive stop. The stop can be quickly removed when tools are to be used on back side of spindle center.

The slide has an additional cross movement operated by a supplementary taper slide, taper being derived from a bar between the ways of the bed, set by a graduated index, to obtain any taper up to four inches to one foot. This obviates the necessity of setting over the headstock for taper-boring or turning, and by this new taper attachment work can be faced off square when taper work is completed, without any change. When used for straight work, the taper side is locked to saddle by a taper tool steel pin, having a square head for its ready removal.

The automatic feed allows pieces of any length to be operated on within the range of the machine. When automatic feed is not used, the saddle may be locked to bed by gib screw at right-hand side of apron. Further information may be obtained regarding this lathe by writing to the Springfield Machine Tool Company, Springfield, Ohio.



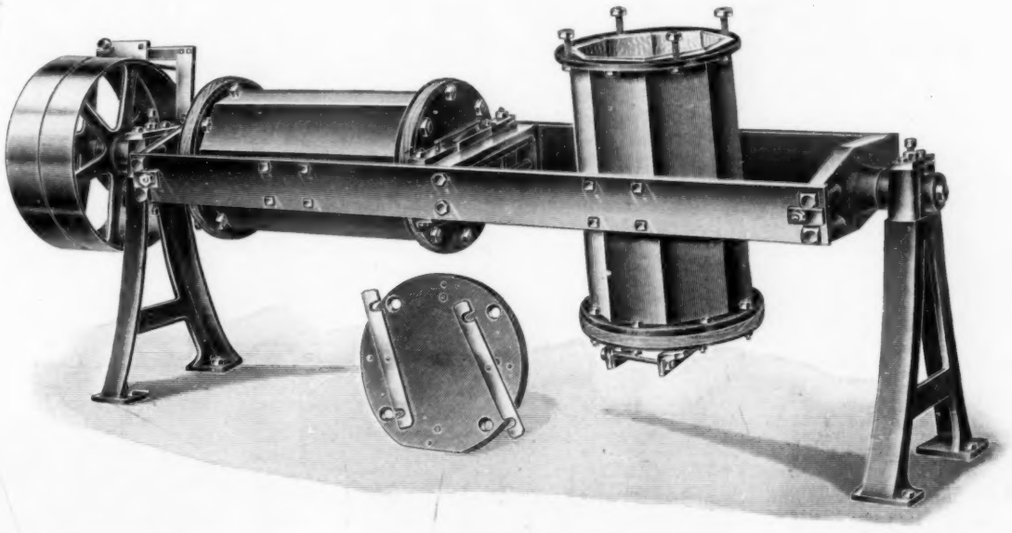
18 INCH x 6 FEET CABINET TURRET LATHE WITH FRICTION-GEARED HEAD.

TUMBLING BARRELS

The method of polishing and burnishing small metallic articles in tumbling barrels by means of hardened steel balls, now extensively in use, came into vogue seven years ago and was based on the idea that very hard, smooth balls about one-eighth of an inch in diameter might be regarded as burnishing tools. While the splendid results obtained by the use of the balls are to be attributed very largely to the skill of the men who operate the barrels, with whom it has become a trade, something is also due to the construction of the barrels. The main features of the barrels are these: They run horizontally; in the interior they are made of hard wood and they are water-tight. Occasionally wooden barrels are used that are held together with hoops, but commonly the barrels are made of cast iron, then lined with wood, and are so constructed that they can readily be re-lined when necessary. Another essential feature is that the opening when in the side of the barrel be long enough to let all the contents fall out when emptying.

The nature and the quantities of the different kinds of goods to be handled, and at the same time kept separate, determine the size and number of barrels required for any given output. Another consideration is, whether the form of the barrel shall be cylindrical or polygonal. The polygonal does the work a little quicker; the cylindrical does it a little better. Whether the barrels shall be comparatively small and be filled and emptied at the ends, as shown in the illustration, or be large in diameter and of sufficient length to be partitioned into several compartments is a question to be decided according to the conditions in each case. The pivoted barrels shown in the illustration are 10 inches wide and 24 inches long inside of the lining, but they are made longer or shorter to meet special requirements.

The idea of using balls originated in the New England watch factory and the first barrels in which to use them were made as shown in the illustration excepting in regard to some of the details, such as the manner of pivoting the barrels, the rigid fastening of them when in the horizontal position, with quick release without having to remove any bolts; the locking of the heads of screws to guard against them getting loose, and the ready way of fastening and unfastening the covers when the barrels are to be filled or emptied. All these details are shown in the illustration. The barrels were designed and built in July, 1904, by Henderson Brothers, Waterbury, Conn., who have long been in the business of making tumbling barrels of all kinds.



PIVOTED TUMBLING BARRELS, MANUFACTURED BY HENDERSON BROTHERS, WATERBURY, CONN.

HOT BLAST BRAZING MACHINE

For many kinds of brazing, tempering, annealing, melting metals and for drying sand moulds for casting, and work of similar character, it is entirely a question of securing the proper amount of heat and of the right kind, that can be properly applied to the work. To fill these special requirements, The Turner Brass Works, Sycamore, Illinois, have designed their No. 68-A Hot Blast Brazing Machine, herewith illustrated, which is constructed for use with either kerosene or gasoline as may be desired for fuel.

Two of the most powerful burners that they manufacture are attached to copper-covered flexible oil tubing, which can be of any desired length and is fitted with suitable valves, and connected to a ten-gallon seamless steel tank with air pump and air gauge, as shown in the cut. After the burners are lighted the machine works automatically, throwing powerful flames from the burners, which can be directed and concentrated on a single point, or used independently, as desired. The volume of flame is regulated by means of the needle valves in the burners, and the machine will burn at full blast for five hours without refilling.

This new appliance has a wide range of usefulness, as the large volume of intense heat from these two flexible burners can be applied to parts inaccessible with all other styles of brazing

NO. 68A TURNER HOT BLAST BRAZING MACHINE FOR GASOLINE OR KEROSENE.

apparatus that are made with fixed burners. The Turner Brazing Machine is designed especially for garage use and in connection with general repair work on automobiles and motorcycles, for brazing large castings, for skin drying and baking sand moulds and similar work in foundry, for use in boiler, coppersmith and machine shops, for locomotive and steel car repairing, burning paint on cars, etc. The manufacturers of this machine make a specialty of gasoline and kerosene brazing appliances of various kinds and for special purposes, a machine of similar design to the one illustrated, can be made and fitted with three or more flexible burners of such type as would best suit the special requirements.

IMPROVED RECORDING INSTRUMENT

An illustrated description of Bristol's patented semi-transparent smoked chart recorder was printed in the November, 1906, issue of THE METAL INDUSTRY. Although these recorders are fundamentally simple in their construction and hundreds are in daily service, there has been a call for a recorder in which the record is made with ink. To meet the demand for a frictionless ink type recording instrument to parallel the smoked chart recorder as near as possible in fundamental simplicity, and to accurately record fractions of milli volts and adapted for use as a recording electric pyrometer, the instrument illustated herewith has been developed and placed upon the market by The Bristol Company, of Waterbury, Conn. These instruments have been thoroughly tested out in practical service for two years past and are the result of several years of study and experience with an original* patented design of the frictionless ink recorder using a hinged electrical movement, carrying a retaining receptacle for marking fluid, which extends over the path of the recording tip and is provided with means for periodically making contact with the source of marking fluid and the chart.

Fig. 1 shows the recorder ready for operating.

Fig. 2 is an interior view, showing the galvanometer movement case hinged to the back of the instrument and carrying the inking pad in front of the recording arm.

FIG. 1. RECORDER READY TO OPERATE.

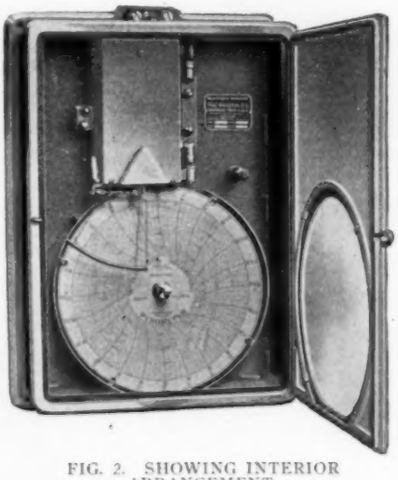


FIG. 2. SHOWING INTERIOR ARRANGEMENT.

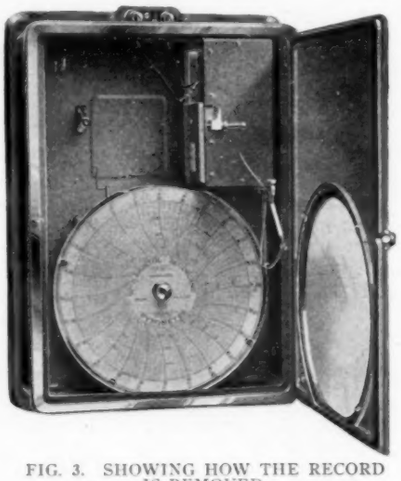


FIG. 3. SHOWING HOW THE RECORD IS REMOVED.

Fig. 3 shows the sensitive electrical movement swung to one side for convenience in removing the record and inserting a fresh chart. A capillary gold tube, open at both ends, is carried at the end of the recording arm at right angles to the surface of the chart. The inking pad is suspended from the case of the electrical movement and is curved to correspond with the arc, covered by the motion of the end of the recording arm. When the movement is swung back into its operating position, as shown in Fig. 2, the recording arm can swing free, accommodating itself to the position corresponding to the delicate current which is to be measured. The clock which revolves the chart at the desired speed also automatically presses the inking pad toward the chart every ten seconds, bringing one end of the capillary tube into contact with the chart, and the opposite end simultaneously into contact with the inking pad. A fine dot of ink is left on the chart and the capillary tube is replenished with ink from the pad. The recording arm thus carries a constant supply of ink, and its perfect balance, which is very important, is always maintained. The electrical movements used in these recorders are made especially for the purpose by the Weston Electrical Instrument Company.

Although the most important applications of these recording instruments have been for pyrometers, they have also been used for electrolytic research, recording voltmeters and recording shunt ammeters.

*Patented by Wm. H. Bristol, April 13, 1909.

PLATINIDE

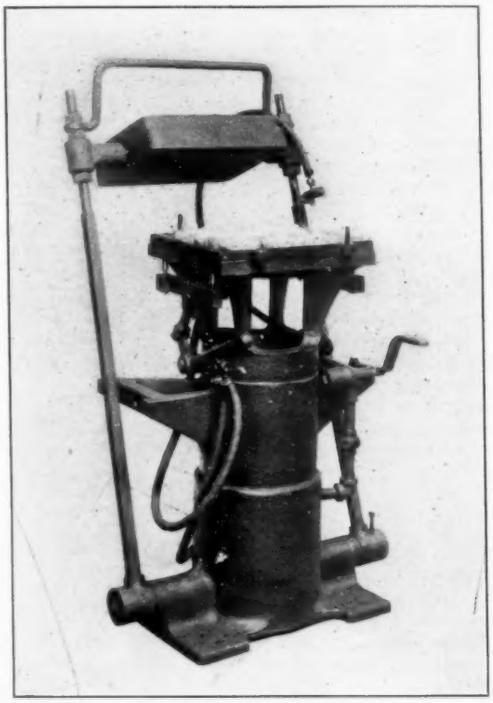
The Platinide Company, metallurgists, of Melrose Highlands, Mass., have lately put out a new metal which they claim is the nearest approach to platinum known. They say that it is characterized by the following qualities: Its color is that of platinum. It polishes readily and acquires a brilliancy of luster higher than that of any other metal. This luster is permanent, as the metal is non-corrodible and will not oxidize. Not only is it immune from ordinary atmospheric influences, but also from the attacks of salt water and salt air. The most potent acids have less effect upon Platinide than upon any other base metal. Nitric acid affects it in the same manner as low grade gold. The close grain of Platinide is one of its most remarkable features. The microscope shows a texture exactly like that of platinum. Doubtless this peculiar character conduces to the extremely tough quality of the metal and to its high ductility.

Platinide is furnished in sheets, wire, tubing and ingots for casting. These are furnished in any gauge and width. The sheet metal may be obtained in rolls or straight lengths, from the softest and most ductile material desired to that of a hard spring temper. Users should bear in mind that the act of working sheet Platinide with the tools hardens and stiffens the metal considerably, and in many instances a thinner gauge may be employed than if other material were employed, for a like purpose. Experience shows that Platinide sheet can be worked into all conceivable articles by processes of stamping, drawing, spinning, etc., and that the articles so made will retain their shape much better than if made of other metals. The most important uses for sheet Platinide are the same as those for platinum.

The Uniform Seamless Wire Company, 71 Peck street, Providence, R. I., have been granted the exclusive agency for platinide in their city.

NEW MOLDING MACHINE FOR BRASS FOUNDRIES

The Turner Machine Company, 3632 North Lawrence street, Philadelphia, Pa., who have for years made hand-power and belt-driven molding machines, are now manufacturing the Turner pneumatic molding machine, which is intended to meet the demand for a machine adapted for use in brass foundries making plumbers' and electrical goods, etc. The illustration given here shows clearly the general features of this machine, which is built in three sizes, 11½" x 15", 12" x 16", 12½" x 18", and are so designed that the pattern plates and flasks used on the Turner hand-power machine are interchangeable. The air



TURNER MACHINE COMPANY NEW BRASS MOLDING MACHINE.

cylinder is 9 inches in diameter, and the admission valve so regulated as to ram the mold quickly and without shock. The machine is furnished complete with vibrators and all necessary fittings. Besides the hand-power molding machines mentioned above, which are used in many important establishments, the Turner Machine Company manufacture foot and power sprue cutters, sand sifters, automatic key lathes, and the Turner automatic cock grinder, which has revolutionized the grinding of large and small cocks, air brake, ammonia and other high-pressure cocks, and which does all the cock-grinding in practically all the brass goods and railroad shops.

THE JOHNSON FRICTION CLUTCH

In the transmission of power in metal working plants, machine shops and factories, the possibilities are unlimited in the way of drives, with which a small, compact, friction clutch can be used. The accompanying illustration, Fig. 1, shows the Johnson friction clutch, made by the Carlyle-Johnson Machine Company, Manchester, Conn. These clutches meet the demand for a small friction drive, occupying a small space. The figures show the smooth exterior of the single clutch, with no projecting parts, and as all the working parts are enclosed they are kept free from dirt. Two views show the interior of the single clutch, which consists of a body fastened to the shaft carrying a split ring in which is inserted a pair of levers. A curve-shaped wedge, which is made part of a shipper sleeve, forces the levers apart, expanding the ring, bringing its outer surface into frictional contact with the inner surface of the friction cup, which is formed at the end of a sleeve and on which can be mounted either a solid or split pulley, as shown in Fig. 2, or cones or gears.

The leverage is compounded so that it requires but little pressure on the shipper handle to operate the clutch. Adjustment is made by means of a collar screw screwed into the base of one of the levers, and is easily reached by a screw-driver through a hole in the edge of the friction cup. This collar screw shifts two hardened tool steel fulcrum blocks also in the base of the

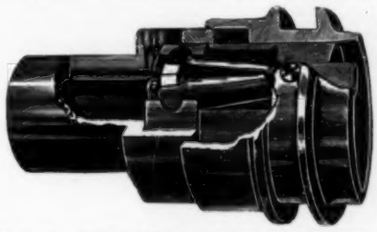


FIG. 1. INTERIOR OF SINGLE CLUTCH.

levers. These blocks are tapered, as well as the recesses into which they are fitted, and when forced down by means of the collar screw, force the levers further apart at the fulcrum point, thus giving a greater expansion of the friction ring.

These clutches are also made double (Fig. 3), which makes them applicable for two speeds, or for forward and reverse motion, attained by crossing the driving belts or by back gearing.

FIG. 2. CLUTCH AND PULLEY.

FIG. 3. DOUBLE CLUTCH.

A new feature of these clutches for line shafts is the driving collar (Fig. 4). This collar is doweled to the clutch body and fastened to the shaft by means of two binder bushings, obviating the necessity of cutting keyways in the shaft, and admits of moving the clutch to any desired position on the shaft.

A special oiling arrangement is also shown in Fig. 5. A cast-iron or bronze bushing, chambered out on its exterior diameter,

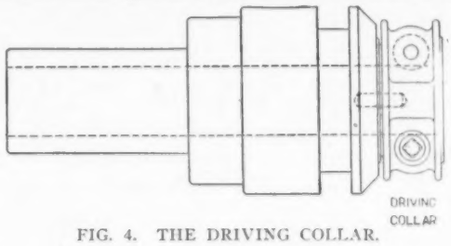


FIG. 4. THE DRIVING COLLAR.

is forced into a clutch hub, bored out large to receive it. Rows of small holes are drilled through this bushing from these chambers to the shaft bore, beforehand, and these holes are plugged with small wood plugs, cut lengthwise of the grain, and a kind of wood is used that is quite porous. The oil chamber formed by forcing this bushing into the clutch hub feeds oil constantly to the shaft bearing through these small wood plugs.

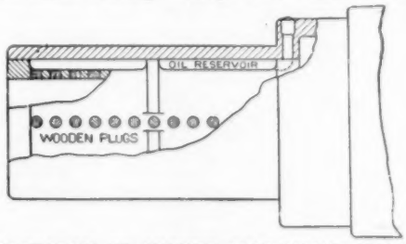


FIG. 5. CAST-IRON OR BRONZE SELF-OILING BEARING FOR CLUTCH HUBS.

Not only as a medium for use on the shafting through which to drive machinery, is the Johnson Clutch used extensively, but its incorporation as a part of metal working machinery by manufacturers of various kinds of machines is extensive. It is so easily modified to meet special conditions that it readily lends itself for use on almost any kind of machinery.

ITEMS OF INTEREST TO THE INDIVIDUAL.

ALFRED J. CROOK

Alfred J. Crook, the new general manager of the Philadelphia Roll & Machine Company, Philadelphia, Pa., succeeding August Marx, deceased, was born in Elmira, N. Y., in 1874. He started to work at the age of fourteen in the mills of the Brown-Bonnell Iron Company, Youngstown, Ohio, and later learned the molding trade, which he followed for a number of years at the plants of the Republic Iron & Steel Company, the Lloyd Booth department of the United Engineering & Foundry Company and The Falcon Bronze Company, all of Youngstown. During this time he attended night schools, obtaining not only a fair general education, but also mastering the principles of mechanical drawing, chemistry and metallurgy of iron and steel.

ALFRED J. CROOK.

Upon leaving the Falcon Bronze Company, Mr. Crook engaged in the foundry business at Youngstown, under the firm name of Crook & Griffith, but disposed of his interest three years later to accept a position as foundry superintendent at the plant of the Youngstown Sheet & Tube Company, where he stayed for four years, leaving this position to become connected with the Philadelphia Roll & Machine Company five years ago. Thus it will be seen that Mr. Crook has been actively connected with rolling mills and their machinery, including rolls, since early boyhood.

J. E. Sterling has become connected with the American Ever Ready Razor Company, New York, as foreman plater.

William A. Leddell, formerly one of the partners in the Finished Parts Manufacturing Company, Newark, N. J., has disposed of his interests in that company and is now connected with the Raritan Copper Company, of Perth Amboy, N. J., as mechanical engineer.

Emmanuel Blassett, Jr., the well-known contributor to the columns of THE METAL INDUSTRY, has taken charge of the plating and polishing department of the R. P. & K. Pressed Metal Company of Bridgeport, Conn., having severed his connection with the Union Typewriter Company of the same city.

Walter B. Snow, publicity engineer, Boston, Mass., announces the recent addition to his staff of Sidney G. Koon, for four years editor of "International Marine Engineering," and later metallurgist for Jones & McLaughlin Steel Company; and also John S. Nicholl, lately with the New York Edison Company and formerly acting manager for F. W. Horne, importer of American machinery, Yokohama, Japan.

Sir William H. White, one of the founders and first president of the Institute of Metals, London, England, designer of the *Mauretania* and former chief constructor for the British Navy, was presented with the John Fritz medal for notable achievement in naval architecture. The presentation took place at the nineteenth annual dinner of the Society of Naval Architects and Marine Engineers, held at the Waldorf-Astoria, New York, November 17.

HENRY R. ATWATER

H. R. Atwater, of Cleveland, Ohio, the recently elected president of the Foundry & Machine Exhibition Company, has been in close touch with the foundry supply business for the past fourteen years. He became actively connected with The Osborn Manufacturing Company in 1894, and has been a director and vice-president of this company since December, 1898. Mr. Atwater was one of the charter members of the Foundry Supply Dealers' Association, which was started in Cleveland six years ago, and also was one of the incorporators and directors of the present Foundry & Machine Exhibition Company. During the past few years Mr. Atwater had devoted his time almost exclusively to foundry practice and machine molding resulting in the invention of several improvements in molding machines. A recent invention of Mr. Atwater's, relating to a jarring device for molding machines, is described among the patents in this issue of THE METAL INDUSTRY.

H. R. ATWATER.

W. Scott Thomas is now established, at Providence, R. I., as the New England agent of the J. W. Paxson Company, of Philadelphia, in place of William T. Nicholson, resigned. The office of the New England agency is located in the manufacturing district not far from the railroad station, and the mail address is P. O. Box 815. Mr. Thomas has been connected with the Paxson Company for the past ten years, having been located in Baltimore, Philadelphia and Detroit, going from the latter city to take charge of the Eastern branch. Shortly the Eastern branch will put Merrill Taggart on the road as an assistant to Mr. Thomas. Mr. Taggart is the son of Edward Taggart, the well-known New York salesman of the Paxson Company.

DEATHS

John Gow, foundry foreman for the General Electric Company, Schenectady, N. Y., died suddenly at his home on November 23, from pneumonia. Mr. Gow was the inventor of the Gow power ramming roll-over core machine.

J. Henry Heil, a manufacturing jeweler for forty years at 202 North Calvert street, Baltimore, Md., was accidentally killed while working over his smelting pot. He was affected by the gas. He was born in Germany 63 years ago, where he learned his trade.

Richmond Viall, who has been superintendent of the Brown & Sharpe Manufacturing Company, Providence, R. I., since 1878, died November 16 at the age of 76. He was born in Barrington, R. I., and came from a very old New England family. Mr. Viall's executive ability and democratic spirit were strong factors in building up the business of the company with which he was connected. His death was caused by a paralytic shock.

George Whiting Hebard, vice-president of the Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., died November 17 at Bronxville, N. Y., at the age of 66. Mr. Hebard has been connected with the manufacturing end of the electrical business for nearly thirty years, and at the time of his death held office in quite a number of firms connected with the electrical business. He was a member of several social organizations and is survived by his wife and two sons.

Edward L. Prior, assistant treasurer of the P. & F. Corbin Company, New Britain, Conn., passed away suddenly at his home in New Britain, November 17. He was one of the oldest of the officials of this company, being connected with the concern since August 17, 1863. For many years Mr. Prior had charge of the private accounts of the late Philip Corbin, and at the time of Mr. Corbin's death was chosen by the trustees of the estate to act as its agent. A man of high character, of quiet voice and gentlemanly manner, devoted to his home and to his work, he was loved and respected by all of his business associates.

CHRISTIAN SILBER

Christian Silber, widely known among silver craftsmen and one of the most valued designers of the International Silver Company, died at his home, 91 Fourth street, Meriden, Conn., at 4:30 o'clock on the morning of November 11, 1911. He had been ill for months, and for the last week the end was momentarily expected. He was fifty-four years old the Saturday previous and leaves a wife, a son, Robert, who is learning die sinking at Factory E. (Meriden Britannia Company), and two daughters, Antoinette, student at the high school, and Josephine, eight years old. He also leaves a brother and three sisters in Europe, one being the wife of Rev. Dr. Buchanan, a prominent London rector.

CHRISTIAN SILBER.

Before coming to this country Chris. Silber studied architecture under the tuition of his father, who was professor of the Politechnic Institute at Stuttgart and one of the foremost architects in that section. In this study the young man made marked progress. After he had been graduated his ambition prompted him to come to America. Arriving here in 1885 he failed to find a position as architect, but a place was offered him with the Photo-Engraving Company, in New York, this being his first opportunity to become familiar with the art of etching. Following this he became a designer on wood for The Meriden Britannia Company, of Meriden. In this capacity he soon perfected himself to a point where he had no superiors. He did not, however, forget his liking for etching and its future possibilities, but continued experimenting until he reached that point where he felt sure he had mastered the art. Toward the latter years it was declared by those who knew that he had no equal in his branch, particularly so as it related to the silver industry.

He held the position as designer and etcher with the International Silver Company (Meriden Britannia Company) for sixteen years, and the exquisite emblematic work for which Mr. Silber was responsible deserved the high praise bestowed by his fellow artists. He was enslaved to accurateness in his pursuits, likewise in all his dealings with men and affairs. He was ever ready to render assistance to his fellow man. In short, he was one of the few in this world that serve as an example to the many to make life worth the living. All who knew him mourn his loss and sympathize with those dear ones he left behind. —L. C. H.

AUGUST MARX

August Marx, general manager of the Philadelphia Roll and Machine Company, died rather suddenly on Monday, November 6, 1911, at his late residence, 1806 Diamond street, Philadelphia, Pa. He is survived by his wife, Mrs. Julia Marx, one daughter, Mrs. Wm. Kreiger, and one son, Joseph; one sister, Mrs. Johanna Feis, of Bad Homburg, Germany, and two brothers, Albert, of New York City, and Maurice, London, England. He was born at Bad Homburg, Germany, in 1857, and left home at the age of 13, taking passage on a sailing vessel as cabin boy, and after sailing the seas the world over for three years landed in New York, whence he drifted to Philadelphia, where he made his home.

AUGUST MARX.

In 1892 he became connected with William Wharton, Jr., & Co., Inc., assuming the superintendence of materials for the construction of the Third Avenue Railroad Company, of New York City. At the time of the formation, in 1895, of the Philadelphia Roll and Machine Company, a subsidiary of the Wharton Company, he severed his connection with the parent company and joined the new one, and his unusual business abilities and qualifications, coupled with his able leadership and exceptional capabilities for organization, soon won for him the active management of affairs, becoming its general manager, which position he held until his death. Through his position with the Philadelphia Roll and Machine Company Mr. Marx was directly connected with the metal industry, and he furnished an article which was published in the July, 1908, number of THE METAL INDUSTRY. This article described the use of old cannon in manufacturing chilled iron rolls.

FREDERICK L. ADAMS

Frederick L. Adams died at his home on Grove street, Waterbury, Conn., on October 3, after an illness of several months' duration. Mr. Adams had been closely connected with the brass business of Waterbury practically all of his life. He was born in Waterbury, October 24, 1850. He started his connection with the brass business as bookkeeper with the Waterbury Brass Company, where he remained until 1880. During an interval of eight years he represented the Lane Manufacturing Company, of New York City. Returning to Waterbury in 1888, he became assistant treasurer of Holmes, Booth & Haydens, which office he held until the company was merged with the American Brass Company in 1906. For the past five years he has been connected with the Chase Rolling Mills. Mr. Adams, though of a retiring disposition, was a man of surprising force and energy, and will be greatly missed by those who knew him best.

FREDERICK L. ADAMS.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

ELECTRO-PLATERS' ASSOCIATION

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Royal F. Clark; Recording Secretary, Edward Faint. All correspondence should be addressed to the Corresponding Secretary, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

The regular monthly meeting of the association was held Friday, November 24, with Vice-President W. J. Schneider in the chair. Eleven active and three associate members were elected. Several amendments relating to branch associations and balloting were adopted, and it was also decided to issue a monthly bulletin. The next meeting will be held December 22.

The regular monthly meeting of the Philadelphia branch was also held on November 24 at Dooner's Hotel, and one active member was elected. After the routine of business L. E. Sturdevant, of the Celluloid Zapon Company, gave a talk on "Lacquers," and exhibited samples. The second annual dinner was held at the Windsor Hotel, November 18, and was a very successful affair, the forty odd guests spending a pleasant evening. The guests were greeted by President Clement with a few appropriate remarks, after which addresses were given by President Proctor of the National Association, G. B. Hogaboom, W. C. Gold, C. G. Backus, William Buckely and others. Mr. Gold then entertained the crowd with selections of operatic airs from noted singers on the Kinalaphone.

ASSOCIATED FOUNDRY FOREMEN

President, Robert B. Thompson; Secretary and Treasurer, Hugh McPhee. All correspondence to be addressed to the Secretary, Hugh McPhee, 50 Cottage Place, Tarrytown, N. Y. Annual Convention with the American Foundrymen's Association.

The regular monthly meeting of the New York section of the Associated Foundry Foremen was held at the Grand Union Hotel, New York, Saturday, December 2. President David C. Wilson introduced the speaker of the evening, Henry M. Lane, who gave an illustrated lecture on "Cores and Core Sands," which was followed by an interesting discussion. Secretary Benjamin H. Ogden announced that the next meeting would be held January 13, 1912.

Robert B. Thomson, secretary of the Buffalo Foundrymen's Association reports that the meeting held November 28 was very well attended. George C. Lehman, commissioner of the Convention Bureau of the Chamber of Commerce, gave an address on "Conventions and How to Get Them for Buffalo." This section is beginning to formulate plans for the entertainment of the foundrymen who attend the convention to be held in Buffalo early next June.

At a recent meeting of the Philadelphia section, held at the Manufacturers' Club, the following officers were elected: James Whitehead, president; Thomas Smith, vice-president; H. A. White, secretary and treasurer; C. J. Krayer, trustee, and C. R. Brown, chairman of the committee on arrangements.

Correspondence

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

PROVIDENCE, R. I.

DECEMBER 4, 1911.

Business in many of the manufacturing jewelry establishments of this city and vicinity, while not as brisk as in some former years, is fairly good at the present time. Some of the gold shops are running overtime and the manufacturers of coats-of-mail and mesh bags are looking forward to a still bigger business next season. The work of getting out the new sample for next year is well under way, and many of them are of a high standard of excellence of finish and design. The bags are shipped to nearly all parts of the United States and Europe, and the output during the past year has been in the neighborhood of nearly half a million. The manufacturers say there is a bigger demand for them and the business to be done during 1912 looks very promising, many large orders having already been received by the local jewelers. The prettiest bags turned out at present are those with the frames engine-turned and engraved. One of the largest manufacturers of mesh bags in this city has had one order of 100,000 mesh bags, colored silver, in North Attleboro this season. Engravers and chasers have been very busy lately, and in a number of factories skilled workmen in these lines have been at a premium.

A charter has been issued from the office of the Secretary of State to Maintein Brothers & Elliott, a manufacturing jewelers' corporation doing business in North Attleboro but incorporated under the laws of Rhode Island. The company is capitalized at $100,000, the incorporators being George Maintein and William F. Maintein, of Attleboro, and Arthur Cushing, of North Providence.

The Colonial Manufacturing Company, which will engage in the business of manufacturing jewelry in this city, was recently granted a charter under the laws of the State of Rhode Island. The company is capitalized for $5,000, the incorporators being Henry S. Wirsching and Henry Lange, of this city, and Arthur Cushing, of North Providence.

H. J. Astle & Company have recently made for the Whiting Manufacturing Company, of Bridgeport, Conn., a large Boland patent pressure blower weighing about three tons. It will discharge 600 cubic feet of air in a minute when running at 100 revolutions a minute. It makes no noise while in operation and is said to supply twice the amount of air produced by half a dozen ordinary blowers.

A most interesting and important group of bronze statues has recently been cast at the foundry of the Gordon Manufacturing Company's plant at Elmwood. These include the figure of "Science," by Bela L. Pratt, one of the much-discussed statues for the long vacant pedestals in front of the Boston Public Library. It is a seated figure with classic folds of drapery, and

will be placed opposite the figure of "Art" on the other side of the great doors of the library. Next in importance are the statues of William Cullen Bryant, by Herbert Adams, and the colossal statue of a typical "Puritan," executed by Henry H. Kitson. The statue of the poet was recently unveiled in Bryant Park at New York. The statue of "The Puritan" is to be erected in Salem, Mass., as a memorial to Roger Conant, the first Governor of Massachusetts. A replica of the statue of Roger Williams at Roger Williams Park, this city; a statue of John Paul Jones, to be placed in Annapolis; a figure which is part of a group for the Boer War Memorial, to be erected in Toronto, Canada, and a statue of August Belmont.

The Irons & Russell Company, manufacturing jewelers, at the corner of Clifford and Chestnut streets, this city, have been observing its fiftieth anniversary the past month, not as a firm in its present organization, but since the founding of the business. A booklet telling of its history and products has been issued to the trade. When first started the business was controlled by Charles F. Irons and was known under that name. Later a partnership was formed, being known as Irons & Russell, and about six years ago the business was incorporated and has been known under its present title ever since.

The Moore-Lonergan Company, a manufacturing jewelry concern, with a capital stock of $15,000, and located in this city, have been incorporated at the office of the Secretary of State. The incorporators are, Robert H. Moore, Roy D. Hollis and Edmund J. Lonergan.

Everett L. Spencer has been elected president of the New England Manufacturing Jewelers' and Silversmiths' Association. The annual meeting, which was held early last month, was important, as many matters pertaining to the future of the association was discussed. The meeting, which was a corporate one, confined strictly to the active members, was prefaced by the annual dinner, at the conclusion of which President George H. Holmes called the gathering to order and the reports of the president, secretary, treasurer and chairman of the advisory council were read. These indicated that the association has made considerable progress during the past year, and that its present condition was very satisfactory. The nominating committee, consisting of Harry Cutler, William A. Copeland, Henry G. Thresher, John M. Buffinton, Frank T. Pearce, Harold E. Sweet and Charles T. Paye, presented its report, and in accordance with its recommendations the following were unanimously elected as officers of the association for the ensuing year: President, Everett L. Spencer, of Providence; vice-presidents, Theodore W. Foster, of Providence; E. L. Gowen, of Attleboro, and Walter B. Ballou, of North Attleboro; treasurer, William T. Chase; secretary, William H. Bell, of North Attleboro; board of directors, William P. Chapin, Frank B. Reynolds, Harry M. Mays, Arthur O. Ostby, Edward B. Hough, Alfred K. Potter, Frederick A. Ballou and Harry Wolcott, all of Providence, Harold E. Sweet, Ralph G. Thompson and Samuel H. Einstein, of Attleboro.—W. H. M.

EAST BERLIN, CONN.

DECEMBER 4, 1911.

This town, which has been going backward ever since the American Bridge shop left here some years ago, is to have a new industry that promises a great deal for the community. The Universal Trolley Wheel Company has leased a portion of the old bridge shop, and already the manufacturing of their product has commenced. The trolley wheel being manufactured here is a patented, self-oiling metal wheel, for which great things are claimed by the inventor. It is said that, while the old-style trolley wheel soon became worn out by friction on the overhead wire and rapid turning, the wheels that are being made here will run for weeks without any signs of wear. The wheel was shown recently at a convention at Atlantic City, and was praised by those who saw it. Considerable stock in the concern is owned by local men.

The Peck, Stow & Wilcox Company is preparaing to close its factory here and move the machinery to Southington. There a fine new factory building is being erected for the plant, and many of the old employees of the company, who reside here, will continue in the employ of the company, going to the Southington factory to work.—A. L. M.

NEW BRITAIN, CONN.

DECEMBER 4, 1911.

The past month has been an important one in the hardware industries of New Britain. Besides the completion of the American Hardware corporation's merger there have been several other important business deals consummated in this city. The manufacture of speedometers is to be taken up in New Britain by a company just organized under the name of the Brown Speedometer Company. The concern is capitalized at $200,000, and starts business with $25,000 preferred stock paid in and $37,000 common, all subscribed for. The officers of this new concern follow:

President, Charles Glover; vice-president, Clarence A. Earle; secretary, George P. Spear; treasurer, Wilbur C. Brown. The officers form the board of directors. Mr. Brown, the treasurer, is the inventor of the speedometer, which is to be the company's product. He was a member of the late President McKinley's staff.

The Traut & Hine Company of this city obtained the controlling interest in the Gold Manufacturing Company, of New York, and the Young Manufacturing Company, a New Jersey corporation, during the past month. The Gold Manufacturing Company's product is a patented safety razor, and the Young concern manufactures safety razor blades. Secretary Henry C. Hine, of the company, has made the statement that both plants will doubtless be moved to New Britain. General business conditions in this city are good at the present time, and the outlook is exceedingly bright. The factories are, without exception, running full time, and large quantities of goods are ordered for future delivery.

A. L. M.

THE AMERICAN HARDWARE CORPORATION

The existence of the constituent companies forming the American Hardware corporation has been terminated, and the plan of reorganization perfected by Charles M. Jarvis, the president, has now gone into effect. All of the directors of constituent companies held separate meetings and voted to turn over all their property, both real and personal, to the corporation, and ceased active business operations at the close of business November 11. All of the changes were made to evade conditions which are now understood to be in violation of the Sherman anti-trust law.

CHARLES M. JARVIS.

President Jarvis, of the corporation has completed all the details of the reorganization, and said to a METAL INDUSTRY representative, "It is not intended that there shall be any change in the trade relations of the various companies. The names now used will be retained, but each of the constituent companies will become divisions of the American Hardware Corporation, with a manager at the head."

A number of promotions and special appointments have been the result of this big merger, the most important business deal of years in the hardware interests of this city.

Charles Glover, president and treasurer of the Corbin Screw Corporation, has been appointed manager of the mechanical equipment of all subsidiary companies of the corporation.

Carlisle H. Baldwin, president and treasurer of the Corbin Cabinet Lock Company, has been selected as manager of production for the entire corporation.

Clarence A. Earle has been chosen manager of the Corbin Screw Corporation, and George P. Spear becomes superintendent of production of this plant.

William H. Booth succeeds C. H. Baldwin as general manager of the cabinet lock factory, E. B. Stone mechanical superintendent, and Frank Woods superintendent of production.

Benjamin A. Hawley is now manager of the Russell & Erwin division of the corporation, and Joseph Schilling is superintendent of the factory.

Charles B. Parsons is promoted to the management of the P. & F. Corbin division, so that his father, Charles H. Parsons, may devote all his time to the duties of first vice-president of the corporation. James R. Fletcher is the new superintendent of this factory.—A. L. M.

NEWARK, N. J.

DECEMBER 4, 1911.

The manufacturing jewelers are quite busy, the demand is general from all parts of the country. The 10-karat lines are selling strong, the 14-karat and better goods are showing an improvement. The cheap lines seem to be in universal demand, as they answer the purposes to the ordinary public and save the wearer money for the time being, even if they do not last as long. Sterling silver goods are keeping up pretty well, while silver plated and German silver lines are in very active demand. Aluminum goods are moving readily, various novelties are called for by the public. The refiners and sweep concerns are doing the usual business. The manufacturers of machinery, tools and dies have had a good summer and fall, putting the jewelry factories in good shape for the heavy demand towards the holidays.

Frank Krementz & Company, who have not been in business long, making a general line of jewelry, are now covering the country in good shape and having a lively demand.

William Hayes, one of the oldest manufacturing jewelers here, of Hayes Bros., died a short time ago at 739 High street. As a marksman he was one of the best shots in the country. George B. Osborn, who was with William Smith & Company, chain makers, till they failed in business, has started in for himself as the Osborn Chain Company, 14 John street, New York City. The Riley-Klotz Company, 17 Mulberry street, who had a $100,000 fire a year ago, have rebuilt their works and are busy making their line of brass novelties and art metal goods.

The W. C. Edge Company have done a much larger business since they moved to the Harpers building, at Washington and Crawford streets. They make the mesh chains, bracelets, etc., and is the only firm here making this line.

Crane & Theurer have taken up a new line of 14-karat fobs. Arthur Theurer has taken charge of the office.

Manufacturers in all lines are requested to send one of their catalogues to the Public Library, where they are kept on file for the benefit of intending purchasers.

B. Keller, who was with Meigs & Keller, has taken charge of the grinding and manufacturing department of the optical firm on Broad street, W. A. Wirth & Company.

Thurstans & Waters, of the Richardson building, are putting out their specialty bar pins.

F. W. Bailey opened the Gift shop at 12 Green street, handling brass, metal and silver novelties. He used to be on the road for Merrill Brothers. Some of the lines he makes himself.

The Newark Technical School has built a new laboratory, which will accommodate 1,000 scholars.

The Eastern Tool Company, of 24 Boudinot street, are making rings for mesh bags.

John J. Kraus bought out his partner, John C. Steeber, and is conducting the jewelry manufacturing business as Kraus & Company.

Robert A. Lee & Company, who have not been in business long at 27 Franklin street, have enlarged their plant and put more machinery in for gilding, coloring and plating.

The Electrolytic Art Metal Company, of Trenton, have opened a branch salesroom at 151 Wabash avenue, Chicago, in charge of S. M. Butler.

The La Pierre Manufacturing Company are getting out a fine line of sterling silver toilet sets.

The Newark Brush Company do a large business in brushes with the manufacturing jewelry and metal trades. Since they moved to their new building, from 12 Green street, to 253 Mulberry street, have doubled their facilities and output.

The Joseph Reinbold Casting Company, Washington street, casting, gold, silver and bronze, have enlarged their plant.

The Ingersoll-Watch Company have engaged as superintendent Thomas Barton, late with the Waltham Watch Company, and the New York Standard Watch Company. He succeeds Mr. Mattheson.

The Standard Pearl Works, 109 Oliver street, are making a new line of pearls for the manufacturing jewelry trade, are making all kinds of novelties, and putting in machinery for making buttons.

Leiman Bros. have added to their blower line and put in a new 50-horsepower gas producer plant.

J. Dupont, who was with the Leon Watch Case Company, started in with his son, as J. Dupont and Son, engravers and engine turners, at 54 Franklin street.

Erle R. Sheppard, of Maiden Lane, New York City, has taken an interest in the manufacturing jewelry firm of Gebbard & Company, this city, and will sell their line on the road, as well as for the Leedin Novelty Company.

Broad & Company, manufacturing jewelers, have put in more machinery, enlarged their plant and taken up new lines. The New York office has been moved to 65 Nassau street, and Oscar J. Brod has succeeded Mr. Byrns as their New York representtative.

J. S. Hobbs has built a new factory for the manufacturing jewelry trade at Mulberry and Oliver streets, which is four stories high, 80 x 100 feet in size.

Strauss & Strauss, of the Union building, doing a ring jobbing business, have taken more space in the building, enlarged their lines and say they will start their own ring factory.—H. S.

PHILADELPHIA, PA.

DECEMBER, 4, 1911.

Philadelphia industries are constantly expanding, and the growth of the jewelry and metal working lines is larger every year. The city is growing steadily, the erection of new factories this year runs into the many millions, and the output is sent all over the world. This year of 1911, while a little less than normal, has not been as bad as in some places. The buildings in the jewelry district are being improved and new ones erected, which is working a change in that section. There have not been many failures. While collections have been slow at times, payments are usually met when due. The coming year will not show much improvement, however, as it is Presidential election year, and this is always quiet in a business way. J. E. Caldwell & Company made a $1,000 silver trophy for the American Automobile Association, presented by the citizens of Anderson, S. C. They also made medals for the speed boat races on the Delaware River, for the Delaware River Yacht Racing Association.

The School of Industrial Arts, at Trenton, N. J., that has built a $125,000 building, is in charge of Frank F. Frederick. The school courses have been extended to take in jewelry, pottery, silver, tile, metal work, etc., and a fully equipped shop has been opened for craft work in copper, brass, silver and German silver, etching, soldering, enameling, engraving, stone setting and craft jewelry working are also taught.

A. Noorian has opened a jewelry making shop at 633 Bartlett building, Atlantic City, N. J. He is making an 18-22 karat line as well as special order work.

It has been reported that the Lakewood (N. J.) Metal Company will build a new plant.

The Jackson Ornamental Iron and Bronze Works, of Jackson, Tenn., was represented at the undertakers' convention at Atlantic City, N. J., by Will R. Sparkman, the vice president and inventor of some of their articles of manufacture. This is a new firm. The president is J. C. Feltsenthall; secretary and general manager, J. J. Losier; treasurer, L. J. Weise; superintendent, W. M. Burns. The firm is building a large factory to manufacture all kinds of metal fixtures and contractor's supplies. The exhibit at Atlantic City was a child's pedestal for the undertakers, which was made of brass. This firm has installed one of the largest and most up-to-date plating plants in the country. They do a large business through the South.

The Keystone Plating & Manufacturing Company have taken the entire building at 411 Cherry street for the plating business and the manufacturing of light metal specialties.

The Camden Copper Works, at Second and Clinton streets, Camden, N. J., had a bad fire, which caused a loss of $10,000. Through excellent work of the firemen a portion of the building was saved.

William D. Paules and John Ruch were prospecting at Slatedale, Pa., and claim to have discovered gold. They have leased 600 acres of land along the base of the Blue Mountains. They say that gold is to be found in the clay, sand and quartz rock abounding thereabouts.—H. S.

BUFFALO, N. Y.

DECEMBER 4, 1911.

The business conditions in Buffalo from most sections for the metal working concerns are improving daily, and are better than they have been for some time. New additions have been made, and with a few new plants here, the outlook is quite favorable for 1912.

W. J. Kumpf, president of the Black Rock Brass and Bronze Company, of Chandler street, died suddenly November 23. He was well known throughout the West in the foundry business, and was well liked here in business circles. His brother, George Kumpf, was elected in his place. F. D. Enoch, manager and treasurer of the firm, states that business is progressing rapidly and that very large quantities of non-grain metal are shipped out from this factory to all parts of the United States, for which there is a large demand.

Buffalo Copper Brass Rolling Mill Company are especially busy at this season of the year for the holiday trade.

Fries & Company, of 93 Main street, are doing a large business in brass finishing, etc. Mr. Fries, of this firm, is at present seriously ill, and a speedy recovery is hoped for.—McG.

CLEVELAND, OHIO

DECEMBER 4, 1911.

Business with the manufacturers and dealers in metals for the past month has been fairly satisfactory. The impression prevails that the winter is going to be a good one and that most of the plants will be kept busy. The various lines in which Cleveland excels are progressing in a very satisfactory manner and reports show that conditions generally are as good or even better than they were a year ago.

George S. Mitchell, manufacturer of brass goods and household novelties of various sorts, who is now located on West 3d street, during the past month secured a tract of land on Cedar avenue at the corner of East Sixty-third street, consisting of about half an acre of fine land on which he proposes to erect at once a new factory. The new plant will be two or three stories in height and will contain about 30,000 square feet of space. It is expected that building operations can be started this fall and the building made ready for occupancy early next spring. It will be of brick construction and modern throughout.

Another new concern was launched here during the month known as the Sterling Brass Company, which secured incorporation papers with a capital of $30,000, to enter the brass manufacturing business. The incorporators of the new concern are Alfred A. Benesch, Reuben Shapiro, Henry A. Rocker, E. M. Chaloupka and A. J. Kornhauser.

Cleveland brass workers, through their union here, are starting an agitation for higher wages. No effect of the movement has been felt thus far, but the manufacturers are watching the movement carefully with a view to keeping in close touch with the situation. It is felt that the present wages are adequate, considering the business outlook for the presidential year which is now approaching. The national president of the brass workers has been in town with some other officers of the organization agitating the increase in wages to the brass workers.

Building totals for the year in Cleveland are a million and a half ahead of last year. This is also reflected in the increased sales of plumbing supplies which are manufactured on a large scale here.

One of the interesting corporations of the past month was that of the Toledo Metal Spinning Company of Toledo, which was incorporated with a capital of $10,000 by Walter R. Emig and others.

The Antique Jewelry Shop Company of Cleveland has been incorporated for $10,000; William Lichtenfeld, J. Cohn, Harry Grossberg, E. Cohn, J. Myron Cohn.

The central fixture which will hang from the center of the auditorium at the new Temple being erected for the Israelite Anshe Chese Society, at Euclid avenue and 82 street, will be the largest in the city, according to the Brookins Company, Euclid avenue and E. 18th street, who have the contract for furnishing all the electrical fixtures for the Temple. This fixture will be cast brass and all the fixtures are of special design.—S. McM.

DETROIT, MICH.

DECEMBER 4, 1911.

The general conditions of the brass and aluminum trade is somewhat improved over that of one month ago. The direct cause of this is hard to determine, although in regard to plumbers' supplies it is perhaps due to the good weather that is now being enjoyed, and contractors and builders are working late in the season. Building of every description is still in progress here in Detroit, and will be extended well along into the winter, if present weather conditions continue. The demand for plumbers' supplies continue fair and considerably above the same period of one year ago. The same is said of other lines of brass and aluminum business, exclusively of the automobile trade. The latter has a boom all its own that has continued lively for the entire season. There are few, if any, idle men at present engaged in these lines. At the same time manufacturers are frequently advertising for more help. Just at present, however, there seems to be little call for additional men for brass and aluminum work.

Two of Detroit's large brass and aluminum concerns during the last month have arranged for factory extensions. The Aluminum Castings Company has let contracts for an addition to its factory building on Chene street. The mason work will be done by Martin Burkheiser, the steel will be furnished by the Russel Wheel and Foundry Company, the carpenter work goes to M. Esper & Sons, all three concerns being located in Detroit. The roofing tile will be supplied by the Hathaway Company, of Cleveland.

Allen & Hill, Detroit architects, have let for the American Brass and Iron Company additional contracts on its factory building, covering the sheet metal and plumbing; Chandler & Oehring get the sheet-metal contract, and A. W. Schultz & Company the plumbing. Both concerns are in Detroit. The additions being erected by these two brass and aluminum firms show that business conditions in these lines are strong and prospects for the future are good. The Scrips Car Company also have recently let contracts for an addition to their factory. This concern manufactures engines principally for boats and aeroplanes.

Two of the largest consumers of seamless brass tubing in the country are the Daisy Manufacturing Company and the Markham Air Rifle Company, both of Plymouth, Mich., which lies about fifty miles northwest of Detroit. These concerns are making about 95 per cent. of all the air rifles sold in the world. During the last few months the factories have been running to their greatest capacity and employ hundreds of men, who are doing their best to keep up with orders for the holidays. These air rifles command a large amount of brass, about all of which is purchased from Detroit. The factories are so crowded with work that no one knows when a lull may be expected. The personnel of the Daisy Manufacturing Company is made up of the following: President, H. W. Baker; vice president, C. H. Bennett; treasurer, E. C. Hough; secretary, G. H. Hunter. This company also maintains an export office in New York, a Pacific Coast office in San Francisco and foreign offices in London and Hamburg. The officers of the Markham Air Rifle Company consist of the following: President, W. F. Markham; vice president, E. S. Roe; secretary, S. G. Hudd; treasurer, L. H. Markham. All its business is done direct from Plymouth and through jobbing houses.—F. J. H.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

The Hawkins Pump Works, Downer's Grove, Ill., are erecting a brass foundry which will be used to manufacture castings for their own factory.

The International Acheson Graphite Company, of Niagara Falls, N. Y., has been awarded a grand prize by the Turin Exposition, Turin, Italy.

The Ventilating Sash Lock Company, Princeton, W. Va., is a new concern which will engage in stamping and plating. J. W. Thorn is president of the company.

The Keeler Brass Company, Grand Rapids, Michigan, are building an addition to their plant that will give them an additional floor space of about 20,000 square feet.

Vogel & Schemmann, of Kabel, I. W., manufacturers of sand blast machines, twist drills, milling cutters, etc., have opened a branch office at the Fulton building, 50 Church street, New York.

The Aluminum Castings Company, manufacturers of castings in aluminum, brass and bronze, Detroit, Mich., are making an addition to their plant on Chene street, which will cost about $75,000.

The Waterbury Brass Company, Waterbury, Conn., are preparing plans for the new casting shop, which will be a one-story building, of brick and steel construction and 65 by 160 feet in dimensions.

The Maxwell Engineering Company, Rome, N. Y., will engage in the manufacture of brass, bronze and aluminum castings, having again placed their foundry in operation after an idleness of ten years.

The Crane Company, Chicago, Ill., report through J. C. Kilgore, superintendent of buildings, that they are erecting a five-story, fireproof, steel and concrete construction, brass foundry, 70 by 130 feet, at 157 North Desplaines street.

The Craig Foundry Company, manufacturers of automobile castings, Bucyrus, Ohio, report through William H. Craig, manager, that the first of the year they will build and equip a new plating room, 30 by 60 feet, in which they will do all kinds of electroplating and japanning.

The published report regarding the new building of the Atlas Metal Works, Dallas, Texas, is not entirely correct. The company report, through their secretary-treasurer, that they have acquired some property and expect to begin within a few months the erection of a factory 75 by 250 feet.

The F. A. Neider Company, manufacturers of hardware specialties and brass articles for carriage and auto top trimmings, Augusta, Ky., have recently installed a nickel plating plant, and expect in the near future to install a plant for furnishing the gun metal finish.

The New York Metallizing Company, who cover wood and plaster forms seamless with copper, brass or bronze, Pearl and Prospect streets, Brooklyn, announce that Lewis Rodman Schultz, who has had many years of experience in architectural bronze work, has become connected with their company.

Kraeuter & Company, manufacturers of mechanics' tools, Newark, N. J., are building a reinforced concrete addition, 60 by 75 feet, to their plant at Sixteenth street and Eighteenth avenue. The estimated cost of the structure is $40,000, and it is expected to be ready for occupancy in about two months.

The firm of T. P. Kelly & Co., of New York, Chicago and Hamilton, Ohio, will continue under the same name as formerly. The firm is now composed of M. F. Kerby and W. F. Kaine, Jr., who will operate and conduct the business in the same manner as that employed by the late T. P. Kelly.

The Electric Smelting and Aluminum Company, of Lockport, N. Y., mention that they are making steady progress with their Mineral Cleaner, and that among others they have made arrangements with the supply house of The Bennett-O'Connell Company, 3600 South Morgan street, Chicago, to handle this cleanser.

At the recent meeting of the directors of the Kettler Brass Manufacturing Company, Houston, Tex., H. H. Robinson was elected president; F. L. Sehnert, secretary, and M. F. Kettler general manager. The above mentioned gentlemen, together with J. S. Rice and W. D. Sherwood, who is vice-president, constitute the board of directors.

The Taunton-New Bedford Copper Company, manufacturers of pure copper in all forms, muntz metal, naval brass and bronze, manganese bronze, etc., New Bedford, Mass., have begun the construction of a new rolling mill at their works, which will be a brick, steel and concrete structure, 125 by 350 feet, and will double the capacity of that plant.

The Southern Brass Manufacturing & Plating Company, metal founders, Houston, Tex., have taken over the plant of the Economy Plating & Manufacturing Company, and will engage in the manufacture of brass, bronze and aluminum castings. They have also recently installed an electro-galvanizing department and report that business is very brisk.

The Court of Errors and Appeals upheld a verdict of $1,033.33 obtained by John W. Gannon from the Brady Brass Company, of Jersey City, N. J. Mr. Gannon was employed as a salesman under a yearly contract, but was discharged last March while his contract still had about six months to run. He then sued the company for the salary due him for the balance of the year.

The Abbott Ball Company, 9 Hicks street, Hartford, Conn., contemplate erecting a new factory in the Elmwood district of Hartford, Conn. They have already secured the land and are making plans for a modern building in which to carry on the manufacture of steel balls and tumbling barrels for burnishing purposes. It has not yet been determined when building operations will begin.

The Erie Specialty Company, manufacturers of fine hardware, kitchen and soda fountain specialties and advertising novelties, Erie, Pa., have just finished an addition to their foundry department, which is in charge of Joseph Statler. This addition, which more than doubled their capacity, was necessitated owing to the heavy demand for aluminum, brass, manganese bronze and other castings.

The Patchogue Electro Plating Works, Patchogue (L. I.), N. Y., has been taken over by William E. and Fred L. Jones, and they report that they are now doing a flourishing business in all kinds of job plating. The plant is the only plating shop located on Long Island east of Jamaica. Whenever business gets dull the proprietors drum up the trade by touring around the island in their automobile.

The Jackson Ornamental Iron & Bronze Works, which was recently organized with a capital of $25,000, Jackson, Tenn., report through Joseph J. Losier, secretary and general manager, that their new plant is rapidly nearing completion, and will be

in full operation before the first of the year. The company is especially interested in the purchase of supplies for the manufacture of grill work, metal beds, etc.

John Toothill, who, claims to have introduced the art of rolling white metals in the United States, has now located his mill at 294 Taaffe place, Brooklyn, N. Y. Formerly Mr. Toothill had his shop on Canal street, New York, then he moved to New Rochelle, N. Y., but he has found a very good factory building at the address mentioned and believes he will henceforth stay in that neighborhood. He rolls white metals, such as britannia metal and pewter, in all widths and gauges.

The Bavarian Government is adding to its extensive iron foundries and machine shops a brass foundry and brass working shop. It might be to the advantage of manufacturers of melting furnaces and brass working machinery to correspond with Dr. Robert Grimshaw, of Dresden, Germany, A-16. Send duplicate circulars with net prices, c. i. f., Bremen (other quotations will be of no use), and there will be no commissions to pay. This department turns over about $4,500,000 a year from mines, furnaces, shops and cement works.

Samuel T. Moore & Company, 301 Friendship street, Providence, R. I., rollers of britannia metal and makers of bead wire and bead chain, recently put in a new engine of greater horsepower, built by the B. F. Sturtevant Company, of Boston, Mass. Samuel Moore & Company have put in considerable machinery since they have taken up the rolling of britannia and the making of ball chain. The firm says that most of the ball chain used at present is imported, but they are able to make a chain that will compete with the imported product.

A recent visit to the factory of McLaughlin & Co., 10 Pearl street, Buffalo, N. Y., who are manufacturers of and dealers in buffs, compositions and all kinds of platers' and polishers' supplies, disclosed a much more active condition of business than formerly existed. New machinery has been installed, the working force greatly increased and a large stock of raw material, especially for buffs, has been put in. M. F. Legge, who took charge of the business last spring, reports good sales to numerous new as well as old customers.

The Bossert Company, metal stampers and welders, Utica, N. Y., report, through J. R. Jones, general manager, that they are now employing between 125 and 150 men in their plant, which consists of press room, die and tool room, 60 by 220 feet, and nine smaller buildings, which include the hardening and annealing plant, steel shed, coke shed, acetylene welding plant, oxygen generating plant and enameling and nickel plating plants. Their press room, which is 60 by 360 feet, contains a number of the very largest presses ever built for the manufacture of special stampings of all kinds, especially automobile parts.

The Canadian Hanson & Van Winkle Company, Ltd., Toronto, Ontario, has been incorporated with $100,000 capital stock to take over the Canadian business of the Hanson & Van Winkle Company, of Newark, N. J., and the Rupert G. Bruce Company, Ltd., Toronto. The company, which will engage in the manufacture and sale of plating and foundry supplies, has purchased a site in Toronto and has begun the erection of buildings, including modern foundry for nickel castings. Until the new buildings are completed the business will be carried on at the present location, 114-116 Harvis street, Toronto. Rupert G. Bruce is general manager.

Plans completed for the motor car exhibitions to be held next mid-winter provide for two national shows in New York, the one in the Madison Square Garden, January 6-20, and the other in the Grand Central Palace, January 10-17; and one to be held in the Coliseum and First Regiment Armory, Chicago, January 27-February 10. The exhibits will include almost every type and size of power vehicle, from motorcycle parcel carriers to ten-ton trucks. More than one hundred different makes of passenger cars and seventy of work vehicles will be on exhibition in New York, and more than ninety makes of pleasure cars and sixty of business machines in Chicago.

F. A. Tolhurst, vice-president of the Tolhurst Machine Works of Troy, N. Y., has recently been granted a sweeping process patent on the method of drying and brightening small metal goods by means of hot air, patent No. 1,003,827, dated September 19, 1911. This process patent described in the October issue of THE METAL INDUSTRY appears to completely cover the use of hot air in connection with centrifugal action, which process has of late been attracting so much attention. Various patents have heretofore been issued to different persons for specific mechanical devices for accomplishing this result, but their use will evidently constitute an infringement of the Tolhurst process.

The Eynon-Evans Manufacturing Company, Philadelphia, Pa., have recently remodeled their brass and bronze foundry and added a third story to their plant, which will enable them to handle castings from ¼ to 5,000 pounds. The main floor of the foundry, which is equipped with all the modern appliances for facilitating the handling of their work, is 50 by 200 feet. The main floor contains eleven pit furnaces and two Steele-Harvey furnaces, and has a melting capacity of about 5,000 pounds per heat, the air pressure being supplied by two Buffalo forge blowers; also six molding benches. The second floor is devoted entirely to molding machines, while the third floor is used for the storage of metals, flasks and other supplies.

Three men, including the proprietor, were severely burned by an explosion at the plant of the Vail Galvanizing plant, Boston, Mass., on November 11. The cause of the accident was not, as the papers stated, due to the dropping of an ingot of lead into a melting pot, but to the explosion of hot air confined in a 500-pound casting which they were galvanizing. The chamber in the casting had been plugged up, unknown to the galvanizers, and when the casting was dipped into the galvanizing bath, the heat (about 800 degrees) caused the air or any moisture that might have been inside the casting to expand, and blow the casting into three pieces, spraying out at the same time about two or three tons of melted zinc. The company report, through Albert S. Vail, manager, that they are now going full tilt and are making plans to enlarge their plant.

The Imperial Brass Works, manufacturers of brass specialties, Chicago, Ill., have been compelled to enlarge their factory capacity and have built a building 100 by 125 feet, five stories high. The walls and flooring are built sufficiently strong to carry any amount of tonnage required in their line of business. The factory will be equipped with the latest improved machinery, and the brass and bronze foundry is on the top floor, with the very best ventilating apparatus, so there will be no danger of molders suffering from metal fumes or gases. The melting outfit is being supplied by Alfred Fisher, of Chicago, who is installing a battery of twelve furnaces and core ovens, with a capacity of melting 19,200 pounds per day. The plating outfit will be on the fourth floor, about the center of the building, so that men can enter from either side. The floor in the plating room will be of concrete, about six inches thick. This will be one of the greatest plating outfits in the West. The entire factory will be operated with motors of the latest design.

FOREIGN TRADE OPPORTUNITIES

No. 7355. Minerals and oils.—A business man in Italy has requested an American consulate to put him in communication with responsible American firms desiring to increase their export trade in the following articles: Zinc sheets; lead, pig; lard, pure; acid fatty oils; and paraffin. Particular attention is called to lead and zinc, the latter being imported in considerable quantities from Belgium, Germany, and England. The average annual quantity of zinc entered in one Italian city is about 150 to 200 tons, while upward of 400 tons of lead are comsumed in the consular district in question.

No. 7386. Brass shaving-stick cases.—A report from an American consulate in the United Kingdom states that an inquiry has been received from a local firm for the names of American manu-

facturers of brass shaving-stick cases, such as those used by several soap manufacturers in the United States. The consulate requests that firms manufacturing this article send their catalogues, etc., for filing in that office, as well as communicating direct with the firm making the inquiry.

No. 7318. Spun-metal goods and metallic chains.—A resident of Australia writes to the Bureau of Manufactures indicating the need of certain spun-metal goods and metallic chains, and would like to hear from American manufacturers of these articles with a view to securing supplies. Prices are requested per yard on the chains in brass, German silver, and black, or a dark metal. The wire should not be over four-tenths of a millimeter in thickness, 6 links per centimeter, or chain approximately this size. Quotations are desired on each variety for both closed and open links, and if satisfactory it is stated that large quantities would be required. Specifications and drawings of the other metal goods required accompanied the request, and can be obtained from the Bureau of Manufactures. The inquirer desires samples of these articles, for which payment will be made, before orders are placed.

(In applying for addresses, at Bureau of Manufactures, Washington, D. C., refer to file number.)

BUSINESS TROUBLES

The John C. Culbert Company, Providence, R. I., on the friendly petition of all the stockholders, has gone into the hands of a receiver for the purpose of being wound up. Fred A. Otis is the receiver.

A trustee's sale of the book accounts, claims and demands and choses in action remaining uncollected and belonging to the estate of The Susquehanna Metal Manufacturing Company, Susquehanna Depot, Pa., will be held on Tuesday, December 19, by C. F. Curtis, trustee, by virtue of an order of Hon. John S. Courtright, Referee in Bankruptcy of the United States District Court of the Middle District of Pennsylvania.

REMOVALS

The Anderson Chemical Company, New York, have moved their offices from 100 William street to 92 William street, where they have much larger and better quarters.

D. B. Moyer, manufacturer and jobber of electroplating, polishing and buffing supplies, formerly located at Walled Lake, Mich., announces that he has opened offices at 69 Buhl building, Detroit, Mich., and is prepared to quote on a full line of the above mentioned supplies.

Stanley Doggett, manufacturer of the well-known Perfection Parting Compound, has moved his offices to No. 11 Cliff street, New York, where his facilities for handling trade are greatly improved. Mr. Doggett says that in spite of the recent depression in the foundry trade he has found the demand for his various grades of parting compounds very satisfactory.

The F. J. Lederer Company, manufacturers of Buffalo air brushes, exhaust fans and blowers, lacquer lathes, spindles, air filters, etc., Buffalo, N. Y., have removed from 400 Guilford street to 67-73 Forest avenue, where they are now located in a three-story factory building, which covers a space of 92 by 98 feet and is thirty times their former floor space. They are now able to furnish air brushes and accessories for same for any kind of painting, lacquering, etc.

FIRES

A fire during the night of November 21, in the faucet factory of John Sommer & Sons, Newark, N. J., caused a loss of $5,000, which was fully covered by insurance. They expect to be in running shape about the middle of December, meanwhile are in a position to fill all orders from their plant at Washington, N. J.

Referring to the fire at the Holtzer-Cabot Company's factory in Brookline, Mass., mentioned in THE METAL INDUSTRY for November, the company reports that three or four days after the fire they were able to get their departments going again in other quarters, and the fire really occasioned very little delay. The building damaged by the fire has now been repaired, and it is likely that operations will be resumed in it early in January, as nothing now remains to be done except fitting up the interior. The extensive motor department of the company was not in any way affected by the fire, which was confined to the departments in which some of the smaller sundries were manufactured; the office also being damaged.

INCREASE OF CAPITAL STOCK

The W. W. Sly Manufacturing Company, manufacturers of foundry supplies, Cleveland, Ohio, have increased their capital stock from $25,000 to $35,000.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

THE ELYRIA BRASS, IRON & STEEL COMPANY, Elyria, Ohio. Capital stock, $50,000. To manufacture brass, iron and steel castings. Incorporators: J. V. Kennedy, T. J. Whearty, David Ryan, all of Elyria.

THE NATIONAL BRASS FOUNDRY COMPANY, Chicago, Ill. Capital stock, $20,000. To manufacture babbitt metals and metal castings. Incorporators: John Prince, Harry G. Deker and George McGuire, all of Chicago.

THE ROYAL BRASS MANUFACTURING COMPANY, Bridgeport, Conn. Capital stock, $250,000. To manufacture condenser tubes. Incorporators: George B. Hedges, Arleigh Pelham and Edmund W. Van Voorhis, all af Bridgeport.

THE WAYNESBORO METAL & FOUNDRY COMPANY, Waynesboro, Pa. Capital stock, $50,000. To manufacture brass, iron and steel castings. Incorporators: F. D. Miller, C. V. Moore, G. H. Armacast and John C. Benedict, of Westminster, Md., and George B. Beaver, of Waynesboro.

PRINTED MATTER

ALUMINUM SPECIALTIES: A four-page folder is being sent out by The Aluminum Specialties Manufacturing Company, of Fulton, N. Y., successors to the Utica Aluminum & Novelty Works, of Utica, N. Y., which gives an illustration of the new plant recently purchased by the company and also a full double page of illustrations showing the various lines of goods that they manufacture from the metal aluminum.

METALS.—Shimer & Company, Inc., selling agents for Shimer, McGlynn & Company, Inc., Philadelphia, have issued a price list giving a complete list of prices and extras for Monel metal, phosphor bronze and German silver, which products are now being turned out by the new rolling mill recently established in Philadelphia. This mill was completely described in the October and November issues of THE METAL INDUSTRY.

AIR BRUSHES.—The Buffalo Air Brush is described in a booklet recently issued by the F. J. Lederer Company, Buffalo, N. Y. The Buffalo Air Brush, as described in the booklet, is a small

Chem. Lib.

INDEX NUMBER

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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD. THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW AND COPPER AND BRASS

$1.00 Per Year 99 JOHN STREET, NEW YORK 10 Cents Per Copy

A TRADE JOURNAL RELATING TO BRASS, COPPER, TIN, LEAD, ZINC, ALUMINUM, NICKEL, SILVER, GOLD, BRONZE

automatic hand device which is claimed to supersede the hair paint brush and all other devices for the spraying or atomizing of paint, lacquers, etc. The brush is completely illustrated and described in the booklet, which is sent upon request.

BRUSHES: W. J. Jeandron, New York, issues a compact little catalogue of 42 pages relating to his line of carbon brushes, which are called "Le carbone" and are claimed to be considerably superior to other types of brushes now on the market. A full description of the various types, and purposes for which they are used, together with photographs of their shape and prices for same, are included in the catalogue. Copies may be obtained upon request.

LACQUERS.—The Hanson & Van Winkle Company, manufacturers and dealers in platers' supplies, Newark, N. J., have issued a catalogue giving complete descriptions of the numerous varieties of lacquers now handled by them. The catalogue is issued under date of October and is known as Bulletin No. 119. Among the lacquers mentioned in the catalogue are: tycoon, Etruscan, Columbian, Columbian gold, Florentine, Tyrian, verde antique, dip and brush and others.

HEATING AND VENTILATING: A handsome and comprehensive catalogue is issued by the Green Fuel Economizer Company, of Matteawan, N. Y. This book, which consists of 95 pages, comprises catalogue No. 137, and contains full information regarding the heating and ventilating of factories by means of Green's apparatus, included among which are Green's fans, blowers and exhausters, positivflo steam heating coils and complete heating and ventilating equipments. A valuable catalogue to have in the files.

METALS AND ALLOYS.—The Electric Smelting & Aluminum Company, Lockport, N. Y., have issued a very complete little booklet, embellished with a photo engraving plate of the company's plant. The booklet treats of the special metallic alloys produced by this company. These specialties include: aluminum and aluminum alloys, babbitt metals, manganese bronze and copper, phosphor tin and copper, silicon copper, silver bronze and solders. A description of each metal and its alloy mixture is given, and some valuable information is also given relating to the use of special alloys for fluxing and purifying metallic mixtures. Write for booklet "Form B."

POLISHERS' AND PLATERS' SUPPLIES.—A handsome 190-page catalog, bound in stiff board covers, has been issued by the Detroit Foundry Supply Company, manufacturers of foundry supplies, Detroit, Mich. This catalog is entitled, "A Hand Book for Buyers," being Catalog No. 21 of this company's series. The catalog contains illustrations and descriptions of everything for the foundry and finishing departments, handled by this concern. All the newest devices for the foundryman and plater and polisher are completely illustrated and described in this valuable addition to industrial catalogs, which may be had upon request.

CATALOGUE EXHIBIT

An exhibition of every kind of catalogue may be seen at THE METAL INDUSTRY office, 99 John street, New York. THE METAL INDUSTRY is prepared to do all of the work necessary for the making of catalogues, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

AD NEWS

Kirk & Blum, Cincinnati, O., are advertising the Economy Adjustable Hood. They state that thousands of these hoods are in use.

T. P. Kelly & Company, manufacturers of foundry facings and supplies, 544 West Twenty-second street, New York, in their advertisement advise readers to "remember Kelly facings when all others fail," because they guarantee clean castings.

The U. S. Electro-Galvanizing Company, 9 Park avenue, Brooklyn, N. Y., offer in this month's advertisement to pay $500.00 reward for information leading to the conviction for infringement of their patents on automatic galvanizing and plating devices.

"Optimus" Belt and Motor Driven Electro-Plating Dynamos, which are advertised on another page, are fully described in Bulletin 100, now being sent out by the Munning-Loeb Company, manufacturers of electro-plating and buffing apparatus and supplies, Matawan, N. J.

The Edward Schroeder Lamp Works, Jersey City, N. J., call attention to their excellent facilities for manufacturing brass and bronze castings, and metal specialties. They own a large modern machine shop and make a specialty of automatic screw machine work, interchangeable parts, metal spinning, etc.

The Automatic Buffing Machine Company Buffalo, N. Y., show in their advertisement the installation of sixteen automatic buffing machines in operation at the Badger Brass Manufacturing Company's plant. They also give a list of other concerns using them, and the many uses to which these machines can be put are also indicated.

W. H. Flavin & Co., 247 and 249 Centre street, New York, who have long been established in the nickel and brass plating, polishing and metal finishing business, and who also do novelty manufacturing and contracting, have recently added a full line of plating and buffing supplies, and are now prepared to fill orders promptly. They cater especially to retail trade. Their telephone number is 386 Spring.

The Basic Mineral Company, North Side, Pittsburgh, Pa., feature this month Radioclarite. the Miller Bronze Alloy Flux, the invention of Cassius M. Miller. Mr. Miller states that Radioclarite has won out in many of the brass foundries in the Pittsburgh district against all other fluxes. He backs up the strong claims made by offering to send a trial package, for which no charge will be made unless found satisfactory.

In an advertisement on another page the Carlyle-Johnson Machine Company, Manchester, Conn., call attention to the Johnson Friction Clutch which is being extensively used by manufacturers of wire forming and other metal working machines. They invite readers to send for their "Bronze" catalogue, which gives a complete description of small compact clutches for use on feed and speed changes on metal working machinery.

The United States Chemical Company, Cleveland, O., have put on the market a small volt-meter which they have been testing for some time and which they state has been doing all that the larger type of instrument can accomplish, reading correctly within a small limit of error for a year or more. In the event of these volt-meters not reading correctly or getting out of order they can be returned to the manufacturer by mail, which makes the expense of correcting them very low.

The Emery Candle Company, Cincinnati, O., find that there is a great demand for their metal polish stearine, on account of the increasing use of metal polishes due to the development of the automobile industry. The many bright parts of the machines have to be kept in order, which calls for large quantities of metal polishes of various kinds. The Emery Candle Company is one of the chief sources of supply for stearine, and they state that their brand is the best on the market for preserving an emulsion in a liquid polish. This material is advertised in this issue.

The Tube Bending & Polishing Machine Company resume their advertising in this issue. They feature their tube bending machinery for all classes of work. These machines are manufactured under the L. H. Brinkman patents. The company also manufactures an automatic tube polishing machine which is used by a large number of prominent manufacturers throughout the country. This concern was previously located at Newark, N. J., but has been reorganized and is now located at 1300 Bayard street, Baltimore, Md., where splendid manufacturing facilities have been secured.

METAL MARKET REVIEW

COPPER.

NEW YORK, DECEMBER, 11, 1911.

Continued firmness and a steady advance in values are the leading features to note in the copper market during the month of November. Prices during the month were close to 1 cent per pound above the prices ruling at the opening. The demand has been more general and consumers have been free buyers.

The exports total for the month 26,431 tons, against 22,555 tons during October and 30,441 tons for November last year. The total exports for the eleven months of this year show an increase of 28,598 tons compared with the same period of 1910. The total visible supply of copper in England and France, January 1, 1911, was 83,800 tons. December 1 the total visible supply stands at 58,740 tons, or a decrease in eleven months of 25,060 tons, and yet during the same eleven months we have exported in excess of the year 1910 28,598 tons; this apparently shows an increased consumption in Europe of 53,658 long tons, or a little over 120,000,000 pounds.

The market today is quiet but very firm. Lake quotable at 13.35c., electrolytic 13⅛, casting brands 13c.

The London market shows a net advance for the month of about £4 per ton, closing at £59 1s. 3d. for short standard.

TIN.

Deliveries into consumption during November were 3,100 tons against 3,500 tons during October. This slight decrease in consumption had no effect on the London bull clique. Prices were run up from £190 5s. at the opening to £205 at the close. It is reported that the leading interest in this market was caught by the syndicate for several hundred tons at around £200 per ton. From present indications this performance is likely to be repeated. We have very little tin afloat for this market, and we will have to buy certainly 2,000 tons in London some time during the month.

It hardly seems credible that this market consuming—say, 3,500 tons a month—should be everlastingly content to jog along, entirely at the mercy of the London syndicate, without any apparent plan or effort to make for an independent and regular supply of this commodity. The leading interests have more than enough money and brains to fully protect their interests in this market and to play the game for all it is worth, instead of being content to pay the Londoners thousands and thousands of dollars each month for the privilege of being played as (to use a very slangy but most expressive Americanism) "suckers."

The market today at £205 London and 46 cents New York looks as good and strong as it always does, with very little tin on spot and not much more coming along. Spot 5-10, tin lots 46.25, December 45.50, and January at 45. Later: The market is weaker and prices are lower closing at 4.4 cents.

LEAD.

The Lead Trust put up prices this month and the market today is fairly steady at 4½ cents New York, carload lots, against 4¼ cents a month ago. In St. Louis the market is steady at 4⅜ cents.

SPELTER.

Scarcity of supplies and a combination of events, all favorable for a quick upward turn, were duly taken notice of by the "powers that be" in the spelter market, and prices were hoisted or boosted ("boosted" gives a better idea of the process than "hoisted") to close to 7 cents New York. Some consumers plucked up courage and asked for explanations of the sudden advance, and "manipulation" was timidly hinted at. This was met with the usual solemn denials. Anyway, it would be interesting to know how much was cleared by the coup.

The market today is easier and prices are 15 to 20 points lower than the highest, say 6¾ New York and 6.60 in St. Louis.

ALUMINUM.

The market is quiet at around 18½ to 18¾ for 98-99% ingots in round lots, with 19 to 19½ for smaller lots on spot.

ANTIMONY.

Market very dull, prices a shade easier. Cooksons at 7¾, Halletts at 7.70, with Chinese and Hungarian grade at 7 cents.

SILVER.

The silver market has been rather more active and prices show a net advance for the month of about 1 cent per ounce in New York and ½d. in London, closing at 55c. and 25 9/16d., respectively.

QUICKSILVER.

The market is rather easier again at $45 per flask wholesale and $46 to $46.50 per flask for jobbing lots.

PLATINUM.

Market holds fairly steady at the late advance, due to the holiday jewelry demand. Hard (10%) is quotable at $48.50 per ounce, ordinary refined at $46.

SHEET METAL.

Sheet copper has been advanced to 17 cent base; copper wire to 14½ base; high sheet brass, 14⅞ base; copper tubing 21, and brass tubing 18 cent base.

OLD METALS.

With the steady advance in copper and the continued heavy demand from Europe for all kinds of copper scrap, local dealers have had a chance to get back some good money that seemed to be all going the other way. Prices are all higher than a month ago, and the outlook is favorable for increased demand from consumers.—J. J. A.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

	December 8, 1911.
Stocks of marketable copper of all kinds on hand at all points in the United States, November 1, 1911	134,997,642
Production of marketable copper in the United States from all domestic and foreign sources during November, 1911	111,876,601
	246,874,243
Deliveries:	
For domestic consumption	68,039,776
For export	67,049,279
	135,089,055
Stocks of marketable copper of all kinds on hand at all points in the United States, December 1, 1911	111,785,188
Stocks decreased during the month of November	23,212,454

NOVEMBER MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	13.35	12.60	13.00
Electrolytic	13.25	12.50	12.75
Casting	13.00	12.35	12.50
TIN	45.50	41.05	43.15
LEAD	4.50	4.25	4.35
SPELTER	7.00	6.40	6.65
ANTIMONY (Hallett's)	7.70	7.70	7.70
SILVER	.56½	.54¼	55.75

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.:

1910—Average for year 13.13½. 1911—January, 12⅞; February, 12¾; March, 12½; April, 12½; May, 12⅜; June, 12⅝; July, 12¾; August, 12¾; September, 12⅝; October, 12½; November, 12⅞.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the back advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds. See Want Ad. pages.

Metal Prices, December 11, 1911

NEW METALS.

	Price per lb. Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	13.35
Electrolytic, carload lots	13.10
Casting, carload lots	13.00
TIN—Duty Free.	
Straits of Malacca, carload lots	.44
LEAD—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.50
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	6.75
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lb. lots	25.00
Ton lots	19.25
ANTIMONY—Duty 1½c. per lb.	
Cookson's cask lots, nominal	7.75
Hallett's cask lots	7.70
Chinese	7.00
Hungarian grade	7.00
NICKEL—Duty Ingot, 6c. per lb. Sheet, strips and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots, Blocks according to quantity	.43 to .60
MANGANESE METAL—Duty 20 per cent.	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	1.50
BISMUTH—Duty free	2.00
CADMIUM—Duty free	.90
CHROMIUM METAL—Duty 25 per cent. ad val.	.98
QUICKSILVER—Duty 7c. per lb.	.62
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	46.50
SILVER—Duty free	.55

OLD METALS.

Dealers' Buying Prices. Cents per 2lb.		Dealers' Selling Prices. Cents per lb.
11.50 to 11.75	Heavy Cut Copper	12.50 to 12.75
11.25 to 11.50	Copper Wire	12.00 to 12.25
10.00 to 10.25	Light Copper	11.00 to 11.25
9.50 to 10.00	Heavy Mach. Comp.	11.00 to 11.25
7.75 to 8.00	Heavy Brass	8.75 to 9.00
6.00 to 6.25	Light Brass	7.00 to 7.25
7.50 to 7.75	No. 1 Yellow Brass Turnings	8.00 to 8.25
8.00 to 8.50	No. 1 Comp. Turnings	9.00 to 9.50
3.90 to 4.00	Heavy Lead	—— to 4.25
3.75 to 3.90	Zinc Scrap	—— to 4.25
5.00 to 5.50	Scrap Aluminum, turnings	6.00 to 7.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 17.50
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

INGOT METALS.

		Price per lb. Cents.
Silicon Copper, 10% to 20%	according to quantity	28 to 35
Silicon Copper, 30% guaranteed	" "	32 to 35
Phosphor Copper, 5%	" "	19 to 21
Phosphor Copper, guaranteed 15%	" "	23 to 25
Manganese Copper, 30%	" "	30 to 35
Phosphor Tin	" "	51 to 56
Brass Ingot, Yellow	" "	8½ to 9½
Brass Ingot, Red	" "	11 to 12½
Bronze Ingot	" "	12½ to 14
Manganese Bronze	" "	15 to 16
Phosphor Bronze	" "	13 to 16
Casting Aluminum Alloys	" "	18½ to 24
PHOSPHORUS—Duty 18c. per lb. According to quantity		30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 17.00 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7¾ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7¾ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ¾ inch diameter or over ..... **Base Price.**

(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

	Cents per lb.
ZINC—Duty, sheet, 1⅝c. per lb.	
Carload lots, standard sizes and gauges, at mill	8.50 less 8%
Casks, jobbers' prices	9.00
Open casks, jobbers' prices	9.50

Metal Prices, December 11, 1911

PRICES ON BRASS MATERIAL—MILL SHIPMENTS,

In effect November 27, 1911, and until further notice.

To customers who purchase over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.13⅝	$0.15⅛	$0.16⅛
Wire	.13⅝	.15⅛	.16⅛
Rod	.13⅝	.15⅞	.17⅛
Brazed tubing	.18¼	——	.21
Open seam tubing	.16⅞	——	.19
Angles and channels, plain	.17	——	.19

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass...	⅛c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1⅛c.	" " " "
Wire —Extra spring and brazing wire	⅛c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who purchase 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14⅛	$0.16⅜	$0.17½
Wire	.14⅜	.16⅜	.17½
Rod	.14⅜	.17⅛	.18½
Brazed tubing	.19½	——	.22¼
Open seam tubing	.18½	——	.20¼
Angles and channels, plain	.18¼	——	.20¼

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass..	⅛c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1⅛c.	" " " "
Wire —Extra spring and brazing wire	⅛c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

14.50 per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	17½c.	per lb. base
100 lbs. to 300 lbs. in one order	18c.	" " "
Less than 100 lbs. in one order	19½c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 21c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet— Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1⅛ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1⅝ inch	45	48
2 inch	56	60

Discount 55%.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	16½c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	14½c.	" "
" " " Rectangular sheets other than Sheathing	16½c.	" "
" " " Rod	14½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 22⅝c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Wider than..... and including.....	31in. 12in.	6in. 14in.	14in. 16in.	16in. 18in.	18in. 20in.	20in. 24in.	24in. 30in.	30in. 36in.	36in. 40in.
	in coils.								
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	75	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S.G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4	per cent.	to No.	19,	B. & S.	Gauge,	inclusive	$0.60
6	"	"	19,	"	"	"	.70
9	"	"	19,	"	"	"	.85
12	"	"	19,	"	"	"	1.00
15	"	"	19,	"	"	"	1.15
16	"	"	19,	"	"	"	1.20
18	"	"	19,	"	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS REVIEW, COPPER AND BRASS

A TRADE JOURNAL RELATING TO METALS AND ALLOYS

Index of Volume 9

JANUARY—DECEMBER, 1911

THE METAL INDUSTRY PUBLISHING COMPANY, 99 John Street, New York

ARTICLES MARKED (*) ARE ILLUSTRATED.

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SITUATION WANTED—ARCHITECTURAL BRONZE and IRON—Am thoroughly conversant with the handling of architectural bronze in all its branches from prospect to complete installation. First class working knowledge of Estimating, Drafting, Manufacture and Simple System. Would like to locate permanently in a responsible position with up-to-date concern requiring the service of one who can deliver. Address R. H. T., care THE METAL INDUSTRY.

SITUATION WANTED—By an Expert Cost Accountant, Cashier, Paymaster, also Purchasing Agent. Have had eight years' experience with one of the leading plating supply houses, both in office and as salesman. Can furnish the best of references. Address EXPERT ACCOUNTANT, care THE METAL INDUSTRY.

SITUATION WANTED—BRASS FOUNDRY SUPERINTENDENT or FOREMAN. Thoroughly experienced on ALUMINUM CASTINGS for automobiles, valve pump and general jobbing lines. Thirty-two years old, temperate and a hustler. Well up on molding machines and mixing metals. Address 0-2, care THE METAL INDUSTRY.

PROFESSIONAL

SITUATION WANTED—MECHANICAL SUPERINTENDENT, successful at increasing manufacturing product and reducing the cost. Good organizer to obtain highest quality and quantity of work from employees. Address MECHANICAL SUPERINTENDENT, care THE METAL INDUSTRY.

SITUATION WANTED—METALLURGIST, experienced in smelting and refining of all non-ferrous metals, especially copper and its compositions, white metal alloys, the recovery of metals from drosses and ashes, including the refining of zinc dross and zinc skimmings. Construction of furnaces for the above or reconstruction of entire plants. Address SUPERINTENDENT, care THE METAL INDUSTRY,

SITUATION WANTED—CHEMIST, 30, technical graduate, expert in copper and lead alloy work, experienced in both laboratory and labor supervision, desires change. Address R. M., care THE METAL INDUSTRY.

SITUATION WANTED—CHEMICAL ENGINEER of two years' experience wishes to communicate with a BRASS FOUNDRY desiring a college man who has both business and technical experience and who makes a specialty of Manganese Bronze and Aluminum. Address INGOT, care THE METAL INDUSTRY.

ROLLING MILL EXPERTS

SITUATION WANTED—By a BRASS and COPPER ROLLING MILL EXPERT. A few years ago I took charge of a rolling mill and in a short time they were compelled to work overtime to keep up with their orders. My experience with the company covered all departments of the rolling mill business from selling to making the material. I would like to correspond with a rolling mill that has an opening for such a man. Address METAL ROLLING MILL, care THE METAL INDUSTRY.

STEAM AND ELECTRICAL ENGINEER

SITUATION WANTED—By a practical STEAM and ELECTRICAL ENGINEER, 2nd class N. Y. license; wishes steady employment. Holding a responsible position for the last 8 years with a large modern electrical plant. Good reference; capable of taking charge. Address T. S., care THE METAL INDUSTRY.

DIE SINKER

SITUATION WANTED—By first-class DIE SINKER. Wide experience in flat and silver ware. Dies of all kinds. Capable of taking foremanship. Can furnish best of reference. Address DIE SINKER, care THE METAL INDUSTRY.

METAL ETCHER

SITUATION WANTED—STEEL MEASURING TAPES, ETCHED AND OTHERWISE. Expert wants position early in 1912. Address Y. U., care THE METAL INDUSTRY.

CHASER

SITUATION WANTED—By a CHASER; 12 years' experience on ornamental brass and bronze, chandelier pattern chasing, also silver and brass antique and repouse work. Address B. D., care THE METAL INDUSTRY.

PATTERN MAKER

SITUATION WANTED—FOREMAN METAL PATTERN MAKER experienced on steam specialties and plumbers' brass goods, also the manufacture of general brass goods. Address B, care THE METAL INDUSTRY.

FOUNDERS

SITUATION WANTED—WORKING BRASS FOUNDRY FOREMAN, First-class CORE MOLDER on ARCHITECTURAL BRONZE and CHANDELIER WORK. Twenty years' experience in first-class shops; for the last five years have been foreman. Can furnish the best of references. Address D-5, care THE METAL INDUSTRY.

SITUATION WANTED—Practical BRASS FOUNDRYMAN with 20 years' experience, up to date in all its branches, mixing metals, etc. Can handle men to best advantage and produce first-class results. Can furnish the best of references as to my ability. Can assume charge at once. Address A. M. G., care THE METAL INDUSTRY.

SITUATION WANTED—First-class FOUNDRY FOREMAN wishes a position. Knows business from A to Z. First-class references. Jobbing, auto valves, and all classes of work in non-ferrous alloys. Address Z. Y. X., care THE METAL INDUSTRY.

SITUATION WANTED—Young man who is familiar with the manufacture of high tensile metals and alloys, desires a position. Address K., care THE METAL INDUSTRY.

SITUATION WANTED—By a PLASTER COMPOSITION FOUNDRYMAN with 9 years' experience at fine arts castings in metals, plaster, wax and glue; also for patterns for engraving machines. Address P. C. F., care THE METAL INDUSTRY.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

Advertisements will be inserted under this head at 40 cents per line, 3 lines one dollar, for each insertion, excepting Situations Wanted, which are 50 cents each insertion. Answers sent in our care will be forwarded

SITUATIONS WANTED—Continued

Advertisements Under This Heading 50 Cents Each Insertion

PLATERS AND POLISHERS

ELECTROPLATERS

Any one desiring the services of first class men for the electro-deposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the National Electro-Platers' Association, Royal F. Clark, 246 Fulton Avenue, Jersey City, N. J.

SITUATION WANTED—As ASSISTANT TO FOREMAN PLATER. First-class man on BUILDERS' HARDWARE, my experience dating back to 1888. Can make all solutions and am an expert oxidizer. Address D-8, care THE METAL INDUSTRY.

SITUATION WANTED—I would like to hear from firms who are looking for a first-class all-round PLATER on nickel, copper, brass, cold galvanizing, dipping, etc. Address D-6, care THE METAL INDUSTRY.

SITUATION WANTED—By an ELECTRO-PLATER with 24 years' experience on Silver, Nickel, Copper, Bronze, Brass, Black Nickel and Oxidizing. Always had charge of help. Address D-9, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER, POLISHER and BUFFER. Sixteen years' experience. Have had charge of plant and can give first-class references as to ability and work. Have also installed plating plant. Make a specialty of Nickel, Brass, Bronze, Copper, Oxidizing and Coloring; can make and take care of galvanizing solution. Would like to correspond with a firm who desires such a man. Would prefer to locate in Indiana. Address INDIANA, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER with several years' experience on Nickel, Brass, Copper, Bronze Solutions, oxidizing and dipping. Address J-23, care THE METAL INDUSTRY.

SITUATION WANTED—By a GILDER EXPERT on shades of GOLD COLORING. Age 35. Position in Newark or New York City preferred. Address JEWELRY, care THE METAL INDUSTRY.

SITUATION WANTED—EXPERT PLATER on all finishes from gold to brass desires a steady position. Am steady, temperate and capable of taking charge. Novelties my specialty, but make no choice. Can make all solutions. Have 12 years' experience on all metals. Can install plating room. In answering please give full particulars. Address PLATER, care Cohen, 283 Grand street, New York.

SITUATION WANTED—PLATER, BUFFER and POLISHER, now working, desires position in the East where mental effort and ability would be tolerated. Plates in copper, brass, bronze, nickel, silver, gold platinum, zinc and tin. Makes all chandelier, hardware and art metal finishes. Can install economic and efficient system. Address EXPERT PLATER, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER of wide experience. Thorough knowledge of the latest bright finishes on all kinds of metals—Bright, Copper, Bright Nickel, Bright Silver and Bright Brass. Latest methods of handling help to the best advantage. Address BRIGHT FINISHES, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER. First-class man on nickel, brass, copper, silver, black nickel; understands all hardware finishes, etc. Address N-2, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER who is up to date on all finishes and colors. Desires a position with a good firm. Salary $30 per week. Address D-1, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER who thoroughly understands the plating business from A to Z. Has had several years' experience and is capable of taking charge. Address P. H., care THE METAL INDUSTRY.

SITUATION WANTED—By an ELECTRO-PLATER, 18 years' experience with Nickel, Copper, Brass and Bronze solutions and oxidizing. Can furnish good reference. Address BOX M-9, care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN PLATER, POLISHER and BUFFER with a wide experience, now employed, would make a change. Steady position desired. Address H. G. S., care THE METAL INDUSTRY.

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AND SPECIAL OFFER TO SUBSCRIBERS

THE FIRST COLUMN OF FIGURES GIVES THE PRICE OF THE BOOK ALONE. THE SECOND COLUMN OF FIGURES GIVES THE PRICE OF THE BOOK INCLUDING A YEAR'S SUBSCRIPTION TO THE METAL INDUSTRY

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MIXED METALS OR METALLIC ALLOYS. A. H. Hiorns. 4¼ x 6¾ inches; 434 pages; 45 illustrations $1.50 $2.00

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ALLOYS AND THEIR INDUSTRIAL APPLICATIONS. Edward F. Law. 8¾ x 6 inches; 270 pages; 57 illustrations; 42 microphotographs.... 4.00 4.50

A most valuable work to not only the student of alloy-making but also the practical metallurgist. Consists of twenty-six chapters, covering the influence of mechanical, thermal and chemical treatment on the non-ferrous alloys.

BRASS FOUNDERS' ALLOYS. J. F. Buchanan. 4½ x 7¼ inches; 122 pages; 10 illustrations.... 2.00 2.50

A resumé of the operations involved in the manufacture of the various brass founders' alloy, with some carefully chosen tables of mixtures in present use.

METALLIC ALLOYS. W. T. Brannt. 5½ x 9 inches; 506 pages; 34 illustrations..... $5.00 $5.50

A practical guide for the manufacture of all kinds of alloys, amalgams, and solders used by metal workers; an appendix on the coloring of alloys and the recovery of white metals.

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A manual of instruction in the alloys for hard soldering, oxidation of metals, properties of metals, the process of hard soldering and a number of helpful technical notes. A very useful book.

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GALVANIZING AND TINNING. W. T. Flanders. 5½ x 8 inches; 93 pages; 40 illustrations 2.00 2.50

A practical treatise by an expert on coating with tin and zinc; a special chapter on tinning gray iron castings. (This book does not treat of cold galvanizing.)

MECHANICAL

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PRESS WORKING OF METALS. Oberlin Smith 5¼ x 8¾ inches; 262 pages; 433 illustrations... 3.00 3.50

A treatise upon the principles and practice of shaping metals in dies by the action of presses, together with a description of the construction of such implements in their various forms and of the materials worked in them.

PUNCHES, DIES AND TOOLS. Joseph V. Woodworth. 5½ x 8 inches; 500 pages; 700 illustrations 4.00 4.50

This is practically an encyclopedia of die and punch making, sheet metal working, and the making of special machines of the metal press type. The author covers the subject in the most practical manner.

CHEMICAL

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A treatise covering the production of every shade of color which can be produced on metals. Discussed under, 1, chemical metal-coloring; 2, electro-chemical metal-coloring; 3, mechanical metal-coloring.

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One of the latest American books on this subject. A manual for the electro-plater, giving modern methods of polishing, plating, buffing, oxydizing and lacquering metals. Numerous formulae.

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The latest and most complete work published on electro-plating. A complete treatise on the electro-deposition of metals, deposition by the contact and immersion processes, the coloring of metals, methods of grinding and polishing; also description of voltaic cells, dynamo-electric machines, instruments, etc.

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General Chemical Co., Philadelphia, Pa.
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Wiarda & Co., John C., Brooklyn, N. Y.

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Grasselli Chemical Co., Cleveland, O.
Niagara Alkali Co., Niagara Falls, N. Y.

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Apothecaries Hall Co., Waterbury, Conn.
Grasselli Chemical Co., Cleveland O.
Illinois Zinc Co., Peru, Ill.
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Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Leiman Bros., New York.
Nicholls, W. H., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.

Air Filters.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.

Alloys Made to Specifications.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
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Birkenstein, S., & Sons, Chicago, Ill.
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Damascus Bronze Co., Pittsburg, Pa.
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Fitz, Dana & Co., Boston, Mass.
Genessee Metal Co., Rochester, N. Y.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Alloys, Spark Emitting.
Treibacher Chemical Co., New York.

Aluminum Bronze Ingots.
Electric Smelting & Alum'n Co., Lockport, N. Y.

Aluminum Castings.
Aluminum Company of America, Pittsburg, Pa.
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Atkinson Co., The, Rochester, N. Y.
Light Foundry & Mfg. Co., Pottstown, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.

Aluminum Electrical Conductors.
Aluminum Company of America, Pittsburg, Pa.

Aluminum, Granulated
U. S. Reduction Co., Chicago, Ill.
Standard Rolling Mills Inc., Brooklyn, N. Y.

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Aluminum Company of America, Pittsburg, Pa.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Kemp, W. H., Co., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
United Aluminum Ingot Co., New York
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Kemp, W. H., Co., New York.

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Aluminum Moldings and Extruded Shapes.
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Hassall, John, Inc., Brooklyn, N. Y.
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Aluminum Sheets, Rods and Wire.
Aluminum Company of America, Pittsburg, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Kemp, W. H., Co., New York.
Pilling Brass Co., Waterbury, Conn.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Aluminum Solder (See Solder.)

Aluminum Tubes.
Aluminum Company of America, Pittsburg, Pa.
Ellwood Ivins Tube Works, Philadelphia, Pa.
Kemp, W. H., Co., New York.

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Detroit Foundry Supply Co., Detroit, Mich.
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Stevens, Frederic B., Detroit, Mich.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Wiarda & Co., John C., Brooklyn, N. Y.

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Seymour Manufacturing Co., The, Seymour, Conn.
Stevens, Frederic B., Detroit, Mich.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Wiarda & Co., John C., Brooklyn, N. Y.

Anodes, Platinum (See also Platers' Supplies).

Anodes, Silver (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Jackson, John J., Newark, N. J.
Renziehausen, Wm. F., Co., Newark, N. J.

Anodes, Zinc (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.
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Antimony Metal.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Fitz, Dana & Co., Boston, Mass.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
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Richards & Co., Boston, Mass.
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Fitz, Dana & Co., Boston, Mass.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
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Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
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North American Smelting Co., Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.

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Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
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Reeves, Paul S., & Son, Philadelphia, Pa.
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Schroeder, Edw., Lamp Works, Jersey City, N. J.

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American Smelting & Refining Co., Cincinnati, O.
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Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
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Benson, H. K. & F. S., Glen Ridge, N. J.
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Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y.
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Hussey, C. G., & Co., Pittsburg, Pa.
Manhattan Brass Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Copper & Brass Co., Detroit, Mich.
Pilling Brass Co., Waterbury, Conn.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

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Ansonia Brass & Copper Co., The, New York.
Bridgeport Brass & Copper Co., The, New York.
Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y.
Ellwood Ivins Tube Works, Philadelphia, Pa.
Manhattan Brass Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Copper & Brass Co., Detroit, Mich.
Phenix Tube Co., Brooklyn, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.
Wells, A. H., Co., Waterbury, Conn.

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Manhattan Brass Co., New York.
Schroeder, Edw., Lamp Works, Jersey City, N. J.

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Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Ansonia Brass & Copper Co., The, New York.
Atkinson Co., The, Rochester, N. Y.
Damascus Bronze Co., Pittsburgh, Pa.
Fitz, Dana & Co., Boston, Mass.
Genesee Metal Co., Rochester, N. Y.
Lang, R. F., New York.
Naulty Smelting & Ref'g Co., Philadelphia, Pa.
North American Smelting Co., Philadelphia, Pa.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'f'd Copper Co., New Bedford, Conn.

Bronze Sheets, Wire, Rods, Etc. (See Brass, Bronze and Copper Sheets, etc.).

Bronze Tubes (See Brass, Bronze and Copper Tubes).

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Kelly, T. P., & Co., New York.
Manufacturers' Brush Co., Cleveland, O.
Osborn Manufacturing Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Riehl Manufacturing Co., Cleveland, O.

Buckle Tongues.
Campbell-Warner Co., Middletown, Conn.

Buffing Compositions (See also Platers' Supplies).
American Tripoli Co., Seneca, Mo.
Emery Candle Co., Cincinnati, O.

Buffing and Polishing Supplies (See Polishing and Buffing Machinery and Equipment).

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Buffing and Polishing Wheels (See also Platers' Supplies).
Bacon Felt Co., Winchester, Mass.
Divine Brothers Co., Utica, N. Y.
Stevens, Frederic B., Detroit, Mich.

Bull-Dozers
Wood, R. D., & Co., Philadelphia, Pa.

Burners, Fuel Oil or Gas (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Jersey City, N. J.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Burnishing Barrels (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Oakville, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.

Burnishing Barrels, Leather Meal for
Peckham Mfg. Co., Newark, N. J.

Burnishing Compounds and Chips (See also Platers' and Polishers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Emery Candle Co., Cincinnati, O.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.
Stevens, Frederic B., Detroit, Mich.

Cabbaging Presses.
Farrel Foundry & Machine Co., Ansonia, Conn.
Wood, R. D., & Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Cadmium, Metallic
Gresselli Chemical Co., Cleveland, O.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Richards & Co., Boston, Mass.

Carboy Rockers.
Rockhill & Vietor, New York.

Castings. (See also name of metal wanted).

Castings, Iron Machinery
Bliss Co., E. W., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Caustic Potash (See Platers', Polishers' and Galvanizers' Supplies.

Centrifugal Dryers and Extractors
American Tool & Machine Co., Boston, Mass.
Tolhurst Machine Works, Troy, N. Y.

Chaplets, Perforated (See Foundry Supplies).

Chemicals (See Platers' Supplies).

Chromium Bronze.
Naulty Smelting & Refining Co., Philadelphia, Pa.

Chucks.
American Tool & Machine Co., Boston, Mass.

Chucks, Spinning
Bliss, E. W., Co., Brooklyn, N. Y.
Pryibil, P., New York.

Clutches, Friction
Carlyle-Johnson Machine Co., Manchester, Conn.

Cock Grinder, Automatic
Turner Machine Co., Philadelphia, Pa.

Composition Metal Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Buermann Mfg. Co., August, Newark, N. J.
Damascus Bronze Co., Pittsburgh, Pa.
Eastern Metal & Refining Co., Boston, Mass.
Fitz, Dana & Co., Boston, Mass.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
White & Bro., Inc., Philadelphia, Pa.

Composition Metal Tacks, Nails, Etc.
Hussey, C. G., & Co., Pittsburg, Pa.

Conveyors.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.

Copper, Carbonate of
Apothecaries Hall Co., Waterbury, Conn.
Detroit Foundry Supply Co., Detroit, Mich.
Wiarda & Co., John C., Brooklyn, N. Y.

Copper Castings.
American Manganese Bronze Co., New York.
Atkinson Co., The, Rochester, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.

Copper Ingots.
American Smelting & Refining Co., Cincinnati, O.
Balbach Smelting & Refining Co., Newark, N. J.
Birkenstein, S., & Sons, Chicago, Ill.
Fitz, Dana & Co., Boston, Mass.
Hendricks Brothers, New York.
Lang, R. F., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Taunton-New B'f'd Copper Co., New Bedford, Mass.
White & Bro., Inc., Philadelphia, Pa.

Copper Nails and Tacks.
Hassall, John, Inc., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Scovill Manufacturing Co., Waterbury, Conn.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Copper Rivets.
Hassall, John, Inc., New York.
Hendricks Bros., New York.

Copper Sheets, Wire, Rods, Bolts, Etc. (See Brass, Bronze and Copper Sheets, etc.)

Copper, Shot
Seymour Manufacturing Co., Seymour, Conn.

Copper, Sulphate of
Apothecaries Hall Co., Waterbury, Conn.
Grasselli Chemical Co., Cleveland, O.

Copper Tubes (See Brass and Copper Tubes).

Core Compound (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Core Machines and Core Tapering Machines (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, W. H., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.

Core Ovens (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Gehnrich, Herrmann, New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Smith, J. D., Foundry & Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Coslettizing.
Flavell, E. A., New Britain, Conn.

Cranes.
Detroit Foundry Supply Co., Detroit, Mich.

Crucibles, Stirrers, Stoppers, Nozzles, Etc. (See also Foundry Supplies).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Paige Retort & Crucible Co., Taunton, Mass.
Ross-Tacony Crucible Co., Philadelphia, Pa.
Taylor, R. J., Inc., Philadelphia, Pa.

Crushers, Cinder (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Farrel Foundry & Machine Co., Ansonia, Conn.
Moussette, O. J., Co., Brooklyn, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Cyanide of Potassium (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
McKesson & Robbins, New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Die Castings.
Finished Parts Mfg. Co., Newark, N. J.

Dies, Sheet Metal Working
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Globe Machine Stamping Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Draw Benches—Wire, Rod and Tube
Farrel Foundry & Machine Co., Ansonia, Conn.
Leiman Bros., New York.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Drosses (See Metal Turnings, Drosses, etc.).

Drying-Out Machines.
Baird Machine Co., Oakville, Conn.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Dust Collectors and Ventilating Systems.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., The, Jackson, Mich.
Leiman Bros., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.

Dynamos, Platers' and Galvanizers' (See also Platers' Supplies).
Backus & Leeser Co., New York.
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Canning, W. Co., Birmiingham, England.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson & Van Winkle Co., Newark, N. J.
Leiman Bros., New York.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Stevens, Frederic B., Detroit, Mich.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Elaine (Red Oil).
Emery Candle Co., Cincinnati, O.

Electric Cleaning Compounds (See Metal Cleaning Compounds).

Electroplaters' Centrifugal Dryers
Tolhurst Machine Works, Troy, N. Y.

Electroplating, Polishing, Coloring, Etc.
Electro Bronze Co., Arlington, N. J.
Northern Ohio Mfg. & Refg. Works, Cleveland, O.
Rojas Electro-Chemical Co., New York.
Sargeant Mfg. Co., Newark, N. J.

Emery (See Platers' Supplies).

Emery Wheels (See Grinding Machinery, etc.).

Enameling Ovens.
Gehnrich, Herrmann, New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Engineers, Mechanical, Foundry, Etc.
Pangborn, Thomas W., Co., Jersey City, N. J.
Smith, J. D., Foundry Supply Co., Cleveland, O.

Escutcheon Pins, All Metals
Hassall, John, New York.

Etched Name Plates.
Schweizer, Max., Bridgeport, Conn.

Exhaust Fans.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Lederer, F. J., Co., Buffalo, N. Y.
Leiman Bros., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.

Expert Instruction—Plating, Coloring, Dipping, Etching, Etc.
Rojas Electro-Chemical Co., New York.
Schweizer, Max, Bridgeport, Conn.

Extractors, Centrifugal Drying
American Tool & Machine Co., Boston, Mass.
Tolhurst Machine Works, Troy, N. Y.

Fig Cleanser.
Emery Candle Co., Cincinnati, O.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.

Fire Brick (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.

Flasks, Brass Molders' (See also Foundry Supplies).
Middleditch, Benj., Detroit, Mich.
Nicholls, W. H., New York.
Osborn Mfg. Co., Cleveland, O.
Sterling Wheelbarrow Co., West Allis, Wis.
Stevens, Frederic B., Detroit, Mich.

Fluxes, Metal (See also Foundry Supplies).
Basic Mineral Co., Pittsburg, Pa.
Reeves, Paul S., & Son., Philadelphia, Pa.
Uraniumite Co. of America, Buffalo, N. Y.

Fluxes, Soldering and Tinning
Grasselli Chemical Co., Cleveland, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.

Forgings, Automobile
American Manganese Bronze Co., New York.
Bliss, E. W., Co., Brooklyn, N. Y.
Phosphor Bronze Smelting Co., Philadelphia, Pa.

Foundry Facings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Kelly, T. P., & Co., New York.
McKesson & Robbins, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Foundry Supplies and Equipment.
Basic Mineral Co., Pittsburg, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Friction Clutches
Carlyle-Johnson Machine Co., Manchester, Conn.

Furnace Linings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kroeschell Bros. Co., Chicago, Ill.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Stevens, Frederic B., Detroit, Mich.

Furnaces, Annealing, Brazing, Etc.
Chicago Flexible Shaft Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hartley, Spaickhaver & Fay, New York.
Monarch Eng. Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co

Furnaces, Electric
Bristol Co., The, Waterbury, Conn.

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Farrel Foundry & Machine Co., Ansonia, Conn.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Melting, for Oil, Coal, Coke, or Gas. (See also Foundry Supplies).
Chicago Flexible Shaft Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Ideal Furnace Co., Chester, Pa.
Kroeschell Bros. Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Stevens, Frederic B., Detroit, Mich.

Furnaces, Reverberatory
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Fuel Oil, Refined (See also Platers' Supplies).
Anderson Chemical Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
McKesson & Robbins, New York.
Nikolas, G. J., & Co., Chicago, Ill.
Wiarda & Co., John C., Brooklyn, N. Y.

Galvanized Specialties, Nails, Screws, Etc.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Plants and Equipment. (See also Platers' and Polishers' Supplies).
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Meaker Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Barrels and Automatic Devices.
Globe Machine & Stamping Co., Cleveland, O.
Meaker Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing for the Trade.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Gas Producers and Power Plants
Wood, R. D., & Co., Philadelphia, Pa.

German Silver Ingots, Castings, Etc.
Buermann Mfg. Co., August, Newark, N. J.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.

German Silver Sheets, Wire, Rods, Tubes, Etc.
Michigan Copper & Brass Co., Detroit, Mich.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co.o, The, Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.

Gold Alloys.
Riverside Metal Co., Riverside, N. J.

Gold Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Graphite (See Foundry Supplies).

Grinding Machinery.
Bennett-O'Connell Co., Chicago, Ill.
Blake & Johnson Co., Waterbury, Conn.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Osborn Mfg. Co., Cleveland, O.
Tube Bending & Polishing Machine Co., Baltimore, Md.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Webster & Perks Tool Co., Springfield, O.

Grinding Wheels (See Foundry Supplies).

Heat Gages.
Bristol Co., Waterbury, Conn.

Hoists, Electric, Pneumatic, Hand
Detroit Foundry Supply Co., Detroit, Mich.

Hydraulic Accumulators.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Hydraulic Machinery, Presses, Jacks, Etc.
Farrel Foundry & Machine Co., Ansinia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Iron, Scrap, Dealers in
Smith Co., The Morton B., New York.

Iron Tubes, Brass and Bronze Covered
Phenix Tube Co., Brooklyn, N. Y.

Japanning Ovens.
Gehnrich, Hermann, New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Japans.
Apothecaries Hall Co., Waterbury, Conn.

Jewelers' Equipment and Supplies (See also Platers' Supplies).
Leiman Bros., New York.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Tolhurst Machine Works, Troy, N. Y.

Jewelers' Findings.
Smith & Richardson, Attleboro, Mass.

Kettles, Galvanizing and Tinning (See also Platers' Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.

Lacquer Enamels. (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Celluloid Zapon Co., New York.
Egyptian Lacquer Mfg. Co., New York.
Munning-Loeb Co., Matawan, N. J.
Eureka Pneumatic Spray Co., New York.
Hanson & Van Winkle Co., Newark, N. J.

Lacquering Ovens.
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Lacquer Sprayers.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Paasche Air Brush Co., Chicago, Ill.

Lacquers, Metal (See also Platers' Supplies).
American Lacquer Co., Bridgeport, Conn.
Anderson Chemical Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Celluloid Zapon Co., New York.
Chemical Products Co., Boston, Mass.
Egyptian Lacquer Manufacturing Co., New York.
Eureka Pneumatic Spray Co., New York.
General Bakelite Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.
Munning-Loeb Co., Matawan, N. J.
New Era Lustre Co., New Haven, Conn.
Nikolas, G. J., & Co., Chicago, Ill.

Ladle Heaters and Dryers (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.

Ladles (See also Foundry Supplies.
Detroit Foundry Supply Co., Detroit, Mich.

Lathes, Polishing (See Platers' and Polishers' Supplies).

Lathes, Spinning, Turning, Etc.
American Tool & Machine Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Pryibil, P., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Lathes, Turret
American Tool & Machine Co., Boston, Mass.

Lead, Antimonial
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead Castings, Antimonial
Electro Bronze Co., Arlington, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Leaden Ware and Lead Burning.
Wiarda & Co., John C., Brooklyn, N. Y.

Lead, Pig and Bar
American Smelting & Refining Co., Cincinnati, O.
Atkinson Co., The, Rochester, N. Y.
Birkenstein, S., & Sons, Chicago, Ill.
Chadwick-Boston Lead Co., Boston, Mass.
Fitz, Dana & Co., Boston, Mass.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Lead Pipe.
North American Smelting Co., Philadelphia, Pa.

Leather Meal for Dry Tumbling.
Peckham Mfg. Co., Newark, N. J.

Lubricants.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Lycopodium (See also Foundry Supplies.
Apothecaries Hall Co., Waterbury, Conn.
McKesson & Robbins, New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Magnesium Metal.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Roessler & Hasslacher Chemical Co., New York.

Magnetic Metal Separators (See also Foundry Supplies).
American Concentrator Co., Joplin, Mo.
Capitol Brass Works, Detroit, Mich.
Dings Electro-Mag .Separator Co., Milwaukee, Wis.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Manganese Bronze Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Atkinson Co., The, Rochester, N. Y.
Damascus Bronze Co., Pittsburg, Pa.
Electric Smelting & Refining Co., Detroit, Mich.
Lang, R. F., New York.
Fitz, Dana & Co., Boston, Mass.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Manganese Bronze Sheets, Rods, Etc.
American Manganese Bronze Co., New York.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Manganese Copper.
American Smelting & Refining Co., Cincinnati, O.
Atkinson Co., The, Rochester, N. Y.
Electric Smelting & Alum. Co., Lockport, N. Y.
Lang, R. F., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Manganese Metal.
Leavitt, C. W., & Co., New York.
Reeves, Paul S., & Sons, Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.

Match Plates
Middleditch, Benj., Detroit, Mich.

Metals (See name of metal wanted).

Metal Cleaning Compounds (See also Platers' Supplies).
Anthony, H. M., & Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Emery Candle Co., Cincinnati, O.
Hanson & Van Winkle Co., Newark, N. J.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.
Munning-Loeb Co., Matawan, N. J.
Standard Supply Co., New Haven, Conn.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Metal Fluxes (See also Foundry Supplies).
Basic Mineral Co., Pittsburg, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Uraniumite Co. of America, Buffalo, N. Y.

Metallurgists, Consulting.
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.

Metals, Dealers in all Kinds of New (See also name of metal wanted).
Birkenstein, S., & Sons, Chicago, Ill.
Fitz, Dana & Co., Boston, Mass.
Merchant & Evans Co., Philadelphia, Pa.
Moers, Albert A., New York.
Richards & Co., Boston, Mass.

Metals, Dealers in Old
Birkenstein, S., & Sons, Chicago, Ill.
Genesee Metal Co., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B. Co., New York.
Riverside Metal Co., Riverside, N. J.

Metals, Dealers in Old—Gold, Silver, Platinum
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Goods Drying Machines
Tolhurst Machine Works, Troy, N. Y.

Metal Goods Made to Order.
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Ansonia Brass & Copper Co., New York.
Bridgeport Brass Co., Bridgeport, Conn.
Buermann Mfg. Co., August, Newark, N. J.
Electro Bronze Co., Arlington, N. J.
Flavin, W. H., & Co., New York.
Manhattan Brass Co., New York.
Riverside Metal Co., Riverside, N. J.
Sargeant Mfg. Co., Newark, N. J.
Schroeder, Edw., Lamp Works, Jersey City, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Waterbury Brass Co., Waterbury, Conn.

Metal, Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.
National Sheet Metal Co., Peru, Ill.

Metal Refiners, Gold and Silver.
Genesee Metal Co., Rochester, N. Y.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Refiners—White Metal.
Birkenstein, S., & Sons, Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
Reeves, Paul S .,& Sons, Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Metal, Silver Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.

Metal Spinning. (See also Metal Goods made to order).
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Metal Stamping. (See also Metal Goods made to order).
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Globe Machine & Stamping Co., Cleveland, O.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

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Birkenstein, S., & Sons, Chicago, Ill.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B., Co., New York.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Mold Dryers, Portable (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.

Mold Spraying Machines. (See also Foundry Supplies).
Pangborn, Thomas W., Co., Jersey City, N. J.

Molds, Ingot (See also Foundry Supplies.
Farrel Foundry & Machine Co., Ansonia, Conn.
Nicholls, Wm. H., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Molding Machines. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Turner Machine Co., Philadelphia, Pa.

Monel Metal Sheets.
Merchant & Evans Co., Philadelphia, Pa.

Muntz's Metal—Sheets, Rods, Bolts, Nails, Etc.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Nails. (See name of metal wanted).

Name Plates, Etched
Schweizer, Max, Bridgeport, Conn.

Nickel.
Hanson & Van Winkle Co., Newark, N. J.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Munning-Loeb Co., Matawan, N. J.
Richards & Co., Boston, Mass.
Wiarda & Co., John C., Brooklyn, N. Y.

Nickel-Bronze Castings and Ingots.
Damascus Bronze Co., Pittsburgh, Pa.

Nickel Castings.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
Wiarda & Co., John C., Brooklyn, N. Y.

Nickel Salts. (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Detroit Foundry Supply Co., Detroit, Mich.
Hanson & Van Winkle Co., Newark, N. J.
McKesson & Robbins, New York.
Munning-Loeb Co., Matawan, N. J.
Stevens, Frederic B., Detroit, Mich.
Wiarda & Co., John C., Brooklyn, N. Y.

Nickel, Shot
Merchant & Evans Co., Philadelphia, Pa.
Seymour Manufacturing Co., The, Seymour, Conn.
Wiarda & Co., John C., Brooklyn, N. Y.

Nickel Silver Tubes.
Wells, A. H., & Co., Waterbury, Conn.

Oil Pumps and Storage Tanks.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Oil Separators.
American Tool & Machine Co., Boston, Mass.

Oils, Tempering and Lubricating
Apothecaries Hall Co., Waterbury, Conn.
McKesson & Robbins, New York.
Swan & Finch, New York.

Ovens. (See also Core, Lacquering, Enameling and Sherardizing Ovens).
Gehnrich, Hermann, New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Steiner, E. E., Newark, N. J.

Parting Compounds. (See also Foundry Supplies
Apothecaries Hall Co., Waterbury, Conn.
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Stevens, Frederic B., Detroit, Mich.

Pattern Shop Supplies (See Foundry Supplies).
Pewter.
Standard Rolling Mills Inc., Brookyn, N. Y.

Phosphor Bronze Ingots, Castings, Etc.
Ajax Metal Co., Philadephia, Pa.
Allan, A., & Son, New York.
Atkinson Co., The, Rochester, N. Y.
Damascus Bronze Co., Pittsburgh, Pa.
Illinois Smelting & Refining Co., Chicago, Ill.
Lang, R. F., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Bronze, Cored Bars
Atkinson Co., The, Rochester, N. Y.

Phosphor Bronze Sheets, Wire, Rods, Etc.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Pilling Brass Co., Waterury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Copper and Phosphor Tin.
American Smelting & Refining Co., Cincinnati, O.
Atkinson Co., The, Rochester, N. Y.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Lang, R. F., New York.
Michagan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverdale, N. J.
Roessler & Hasslacher Chemical Co., New York.

Phosphorus. (See also Foundry Supplies).
General Chemical Co., Philadelphia, Pa.
McKesson & Robbins, New York.

Pickling Machines, Automatic
Torrington Manufacturing Co., Torrington, Conn.

Platers' Compound. (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.
Standard Supply Co., New Haven, Conn.
Swan & Finch Co., New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Platers' Metal (See also Platers' Supplies).
Kemp, W. H., Co., New York.
Pilling Brass Co., Waterbury, Conn.

Platers', Polishers' and Galvanizers' Equipment and Supplies.
Abbott Ball Co., Hartford, Conn.
Ames Sword Co., Chicopee, Mass.
Anderson Chemical Co., New York.
Anthony, H. M., Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Automatic Buffing Machine Co., Buffalo, N. Y.
Backus & Leeser Co., New York.
Bacon Felt Co., Winchester, Mass.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Burns, E. Reed, Brooklyn, N. Y.
Canning, W., & Co., Birmingham, England.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
Emery Candle Co., Cincinnati, O.
Flavin, W. H., & Co., New York.
Globe Machine & Stamping Co., Cleveland, O.
Grasselli Chemical Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.
Klauder-Weldon Dy'g Mach. Co., Amsterdam, N. Y.
Leiman Bros., New York.
L'Homedieu, C. F., & Sons, Chicago, Ill.
Meaker Company, Chicago, Ill.
McKesson & Robbins, New York.
Munning-Loeb Co., Matawan, N. J.
Oliver, W. W., Mfg. Co.
Peckham Mfg. Co., Newark, N. J.
Platinum Metals Co., Brookyn, N. Y.
Roessler & Hasslacher Chemical Co., New York.
Rockhill & Vietor, New York.
Rojas Chemical Co., New York.
Roth Bros. Co., Chicago, Ill.
Smith & Richardson, Attleboro, Mass.
Standard Supply Co., New Haven, Conn.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.
Tolhurst Machine Works, Troy, N. Y.
Tube Bending & Polishing Machine Co., Baltimore, Md.
United States Chemical Co., Cleveland, O.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Webster & Perks Tool Co., Springfield, O.
Wiarda & Co., John C., Brooklyn, N. Y.

Plating Barrels and Apparatus.
(See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foupndry Supply Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, C. F., & Sons Co., Chicago, Ill.
Klauder-Weldon Dy'g Mach. Co., Amsterdam, N. Y.
Munning-Loeb Co., Matawan, N. J.
Rockhill & Vietor, New York.
Smith & Richardson, Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Tolhurst Machine Works, Troy, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Platinum Ingots.
Platinum Metals Co., Brooklyn, N. Y.

Platinum Salts and Solutions.
Platinum Metals Co., Brooklyn, N. Y.

Platinum Scrap, Buyers of
Platinum Metals Co., Brooklyn, N. Y.
Roessler & Hasslacher Co., New York.

Plumbago (See Graphite).

Polishing, Buffing and Burnishing Machinery and Appliances (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Ames Sword Co., Chicopee, Mass.
Apothecaries Hall Co., Waterbury, Conn.
Automatic Buffing Machine Co., Buffalo, N. Y.
Backus & Lesser Co., New York.
Bacon Felt Co., Winchester, Mass.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Cleveland Blow Pipe Co., Cleveland, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
Flavin, W. H., & Co., New York.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., Jackson, Mich.
Leiman Bros., New York.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Middleditch, Benj., Detroit, Mich.
Munning-Loeb Co., Matawan, N. J.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Osborn Mfg. Co., Cleveland, O.
Peckham Mfg. Co., Newark, N. J.
Pfleghar Hardware Sp'lty Co., New Haven, Conn.
Roth Bros., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Tolhurst Machine Works, Troy, N. Y.
Tube Bending & Polishing Machine Co., Baltimore, Md.
United States Chemical Co., Cleveland, O.
Webster & Perks Tool Co., Springfield, O.

Polishing Belts, Endless (See also Platers' Supplies).
Ames Sword Co., Chicopee, Mass.
Divine Bros. Co., Utica, N. Y.

Polishing Meal for Dry Tumbling
Peckham Mfg. Co., Newark, N. J.

Potash. (See also Paters' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
International Chemical Co., Camden, N. J.
McKesson & Robbins, New York.
Niagara Alkali Co., Niagara Falls, N. Y.
Wiarda & Co., John C., Brooklyn, N. Y.

Presses, Bench and Foot
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterury, Conn.
Bliss, E. W., Company, Brooklyn, N. Y.
Leiman Bros., New York.
Shuster, The F. B., Co., New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Cabbaging
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Presses, Coining
Bliss, E. W., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Drop
Bliss, E. W., Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Peck Drop Press Works, New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Drop Lifters for
Peck Drop Press Works, New Haven, Conn.

Presses, Filter.
American Tool & Machine Co., Boston, Mass.

Presses, Power
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Foundry Co., Pittsburg, Pa.
Peck Drop Press Works, New Haven, Conn.
Torrington, Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Pressure Blowers (See also Foundry Supplies)
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Leiman Bros., New York.
Monarch Eng. Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Pumice (See Platers', Polishers' and Galvanizers' Supplies).

Pyrometers.
Bristol & Co., The, Waterbury, Conn.

Radioclarite
Basic Mineral Co., Pittsburg, Pa.

Riddles (See also Foundry Supplies).
Kelly, T. P., & Co., New York.
Stevens, Frederic B., Detroit, Mich.

Riveting Machines.
Shuster, The F. B., Co., New Haven, Conn.
Wood, R. D., & Co., Philadelphia, Pa.

Rivets—Brass, Aluminum, Etc.
Hassall, John, Inc., New York.
Hendricks Bros., New York.
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Rojas Process of Electro Deposition.
Rojas Electro-Chemical Co., New York.

Roll-Grinding Machines.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Chilled and Sand
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Jewelers'
Leiman Bros., New York.
Oliver, W. W., Mfg. Co., The, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolling Mill Machinery.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rouge. (See Platers' Supplies).

Rust-Proofing Process, (See also Galvanizing).
Flavell, E. A., New Britain, Conn.

Sand, Fire (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Blast Machinery and Equipment.
Leiman Bros., New York.
Mott Automatic Sand Blast Mfg. Co., Chicago, Ill.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Sand Blast Systems
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Blast Tumbling Barrels.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Handling and Conveying Machines
Pangborn, Thomas W., Co., Jersey City, N. J.

Sand Dryers, Sifters and Mixers.
(See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.

Sand, Molding (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Sawdust, Boxwood, for Drying Purposes.
(See also Platers' Supplies),
Sommers, John, Faucet Co., Newark, N. J.

Sawdust Drying-out Boxes.
(See also Platers' Supplies),
Bennett-O'Connell Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
Steiner, E. E., Newark, N. J.

Shears, Power
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington, Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Sheet Metal Straightening, Cutting and Forming Machinery.
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Shuster, The F. B., Co., New Haven, Conn.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

erardizing (See also Galvanizing).
Globe Machine & Stamping Co., Cleveland, O.

Sheradizing Ovens
Gehnrich, Hermann, New York.
Globe Machine & Stamping Co., Cleveland, O.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Silicon.
American Smelting & Refining Co., Cincinnati, O.
Leavitt, C. W., & Co., New York.

Silicon Copper.
American Smelting & Refining Co., Cincinnati, O.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Lang, R. F., New York.
Roessler & Hasslacher Chemical Co., New York.

Silver, Nitrate and Chloride of
(See also Platers' Supplies),
Jackson, John J., Co., Newark, N. J.

Silver Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.

Silver, Rolled Sterling
Jackson, John J., Co., Newark, N. J.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Silver Wire.
Jackson, John J., Co., Newark, N. J.

Smelters of Copper-Bearing Materials.
Balbach Smelting & Refining Co., Newark, N. J.

Smelters, Sweep
Renziehausen, Wm. F., Co., Newark, N. J.

Soap. (See also Platers' Supplies),
Apothecaries Hall Co., Waterbury, Conn.
Emery Candle Co., Cincinnati, O.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.

Solder, Aluminum
Aluminum Company of America, Pittsburg, Pa.
Aluminum Solder Co., Boston, Mass.
Atkinson Co., The, Rochester, N. Y.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Janney, Steinmetz & Co., Philadelphia, Pa.
Kemp, W. H., Co., New York.
Richards & Co., Boston, Mass.
U. S. Reduction Co., Chicago, Ill.

Solder, Brazing
American Smelting & Refining Co., Cincinnati, O.
Fitz, Dana & Co., Boston, Mass.
Hussey, C. G., & Co., Pittsurg, Pa.
Merchant & Evans Co., Philadelphia, Pa.
Naulty Smelting & Ref'g Co., Philadelphia, Pa.
North American Smeting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Solder, Hard, for Cast Iron
Lang, R. F., New York.

Solder, Silver
Jackson, John J., & Co., Newark, N. J.

Solder, Tinners'
American Smelting & Refining Co., Cincinnati, O.
Atkinson Co., The, Rochester, N. Y.
Fitz, Dana & Co., Boston, Mass.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Soluble Cotton.
Anderson Chemical Co., New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Spelter.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Damascus Bronze Co., Pittsburg, Pa.
Fitz, Dana & Co., Boston, Mass.
Grasselli Chemical Co., Cleveland, O.
Hegeler Bros., Danville, Ill.
Hendricks Bros., New York.
Illinois Smeting & Refining Co., Chicago, Ill.
Illinois Zinc Co., Peru, Ill.
Leavitt, C. W., & Co., New York.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
New Jersey Zinc Co., The, New York.
Richards & Co., Boston, Mass.
Sandoval Zinc Co., Chicago, Ill.
U. S. Reduction Co., Chicago, Ill.

Spinning Lathes.
Bliss, E. W., Company, Brooklyn, N. Y.
Pryibil, P., New York.

Spraying Machines.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Paasche Air Brush Co., Chicago, Ill.
Pangborn, Thomas W., Co., Jersey City, N. J.

Sprue Cutters. (See also Foundry Supplies).
Bliss, E. W., Co., Brooklyn, N. Y.
Middleditch, Benj., Detroit, Mich.
Nicholls, Wm. H., New York.
Shuster, The F. B., Company, New Haven, Conn.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Turner Machine Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Stearic Acid and Stearine.
Emery Cande Co., Cincinnati, O.
Rockhill & Victor, New York.

Tacks, (See name of metal wanted).

Tanks, Electroplaters' (See also Platers' Supplies).
Chadwick-Boston Lead Co., Boston, Mass.
Corcoran, A. J., Inc., New York.
Hanson & Van Winkle Co., Newark, N. J.
Munning-Loeb Co., Matawan, N. J.
Stearns, The A. T., Lumber Co., Boston, Mass.
Wiarda & Co., John C., Brooklyn, N. Y.

Tin, Chloride of
Grasselli Chemical Co., Cleveland, O.
Wiarda & Co., John C., Brooklyn, N. Y.

Tinning Machines.
Globe Machine & Stamping Co., Cleveland, O.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Tin, Pig, Bar and Block
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Fitz, Dana & Co., Boston, Mass.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Boston, Mass.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Tin, Sheet Block
Merchant & Evans Co., Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Tramrails. (See also Foundry Supplies).
Rockwell Furnace Co., New York.

Tripoli Flour, Stone, Filters, Etc. (See also Platers' Supplies).
American Tripoli Co., Seneca, Mo.
Wiarda & Co., John C., Brooklyn, N. Y.
Apothecaries Hall Co., Waterbury, Conn.
Detroit Foundry Supply Co., Detroit, Mich.
McKesson & Robbins, New York.
Stevens, Frederic B., Detroit, Mich.

Trolley Systems.
Nicholls, Wm. H., New York.
Rockwell Furnace Co., New York.

Tumbling Barrels, Leather for Dry.
Peckham Mfg. Co., Newark, N. J.

Tube Bending Machines
Tube Bending & Polishing Machine Co., Baltimore, Md.

Tube Polishing Machines
Tube Bending & Polishing Machine Co., Baltimore, Md.

Tubes. (See name of metal wanted).

Tumbling Barrels. (See aso Foundry Supplies and Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Middleditch, Benj., Detroit, Mich.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Type Metal.
American Smelting & Refining Co., Cincinnati, O.
Illinois Smelting & Refining Co., Chicago, Ill.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Uraniumite
Uraniumite Co. of America, Buffalo, N. Y.

Vibrators. (See also Foundry Supplies).
Nicholls, Wm. H., New York.

Vienna Lime (See Platers', Polishers' and Galvanizers' Supplies).

Voltmeters (See also Platers', Polishers and Galvanizers' Supplies).
Bristol Co., The, Waterbury, Conn.
Sangamo Electric Co., Springfield, Ill.
United States Chemical Co., Cleveland, O.

Waste Washing Machines.
American Tool & Machine Co., Boston, Mass.

Wax Wire. (See also Foundry Supplies).
Stevens, Frederic B., Detroit, Mich.

Welding and Tempering Compounds
Uraniumite Co. of America, Buffalo, N. Y.

White Metal Castings.
Electro Bronze Co., Arlington, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

White Metal Rolling for the Trade.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Wire, (See name of metal wanted).

Wire Goods Manufacturers.
Baird Machine Co., Oakville, Conn.
Campbell-Warner Co., Middletown, Conn.

Wire Mill Equipment.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Wire Nails, All Metals.
Hassall, John, Inc., New York.

Wire Straightening and Forming Machinery
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, The F. B., Co., New Haven, Conn.

Wire Wheel and Hand Brushes. (See also Foundry Supplies).
Blumenthal, Hermann, & Co., New York.
Manufacturers' Brush Co., Cleveland, O.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Riehl Manufacturing Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

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Zinc Battery Plates.
Grasselli Chemical Co., Cleveland, O.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.

Zinc, Chloride of (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.
Richards & Co., Boston, Mass.
Sandoval Zinc Co., East St. Louis, Ill.
Wiarda & Co., John C., Brooklyn, N. Y.

Zinc Dust (See also Platers' Supplies).
Globe Machine & Stamping Co., Cleveland, O.
Grasselli Chemical Co., Cleveland, O.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Wiarda & Co., John C., Brooklyn, N. Y.

Zinc Salts, Commercial (See also Platers' Supplies).
Sandoval Zinc Co., East St. Louis, Ill.
Wiarda & Co., John C., Brooklyn, N. Y.

Zinc Sheet and Plate.
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
Merchant & Evans Co., Philadelphia, Pa.
National Sheet Metal Co., Peru, Ill.
Pilling Brass Co., Waterbury, Conn.
Richards & Co., Boston, Mass.

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